# ELECTRICAL SOUTH

SEPTEMBER
1944

UNIVERSITY OF FLORIDA

## FANS by HUNTER.CENTURY

## 55th SEASON

52-In Hotel Type

24-In "Airspread" Ceiling

HUNTER, who has made fans and ventilators exclusively during 55 years, is now operating under War Production Board restrictions. • No more fans will be made except for the Army, Navy and Maritime Commission. HUNTER unfilled orders now on hand represent contracts with Government Agencies. • Certain sizes of belted exhaust types can be made available for Government hospitals and other war industries, subject to limited material inventories now on hand.

## HUNTER FAN & VENTILATING COMPANY, INC.

*Factory*: FULTON, N. Y.

*General Sales Offices*: Memphis, Sterick Bldg. *Eastern Sales Office*: New York, 92 Warren Street *Western Sales Office*: St. Louis, 1706 Olive Street

*Sales Offices*:
ATLANTA
CHICAGO
DALLAS
HOUSTON
LOS ANGELES
PHILADELPHIA

Zephair Comfort Cooling and Commercial Ventilators

*Sales Offices*:
BOSTON
CLEVELAND
DETROIT
KANSAS CITY
NEW ORLEANS
PITTSBURGH

Electrical equipment lives no longer than its insulation . . . but how long will different types of insulation live—and why? There's one simple answer . . .

## use the insulation proved by FIFTY YEARS OF FIELD TESTS!

Westinghouse is in a natural position to know the answers to these problems. The wide variety of electrical apparatus made by Westinghouse during the past half century has served as a continuous, "first-hand" field test for almost every possible type of insulating material.

Out of this constant development has grown the complete line of "Tuffernell" Insulating Materials. And with it, an authoritative file of exact application data that is made available to you by Westinghouse Insulation Specialists.

The new "Insulation Sample Book" illustrates this "insulation know-how". It simplifies selection of tapes, fabrics, papers and varnishes by supplying actual samples, complete with dimensions, ratings and helpful application data. Copies are available through your nearest Westinghouse distributor. Ask for B-3322. Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., Dept. 7-N. J-06357

**Westinghouse**
PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

**INSULATING MATERIALS**

*"They're Tuffernell!"*

ELECTRICAL SOUTH is published monthly by W. R. C. Smith Publishing Co., Marietta, Ga., and Atlanta, Ga., U. S. A.
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Volume 24 Number 9

# don't straitjacket a *Good Genie*

Don't straitjacket the genie of Electricity by poor planning of the electrical wiring in your post-war buildings. Anemic circuits, wiring that is insufficient and too small in capacity, lose wattage that is paid for but never gets to the machine or appliance.

Not only must yesterday's wiring requirements be discarded as the criterion, but proper note must be taken of wiring needs far into the future. To do any less is to condemn a building to early electrical obsolescence, for the greater use of electrical equipment that is promised us will be seriously hampered in buildings that are inadequately wired.

Adequate, proper wiring is a *must*, if tomorrow's buildings are to make full use of cheap, plentiful, labor saving electricity. The Okonite Company, Passaic, New Jersey.

**SAME SIZE CONDUIT**

#14 #12

Wire *size* is as important as having sufficient wiring. For instance, No. 14 wire has been a standard in building for generations yet No. 12 wire will carry one-third more current, reduce voltage drop by more than a third, deliver more power for your money and yet requires no larger conduit or fittings.

ADEQUATE WIRING THE KEY TO INCREASED PRODUCTION

**OKONITE and HAZARD**
**INSULATED WIRES AND CABLES**

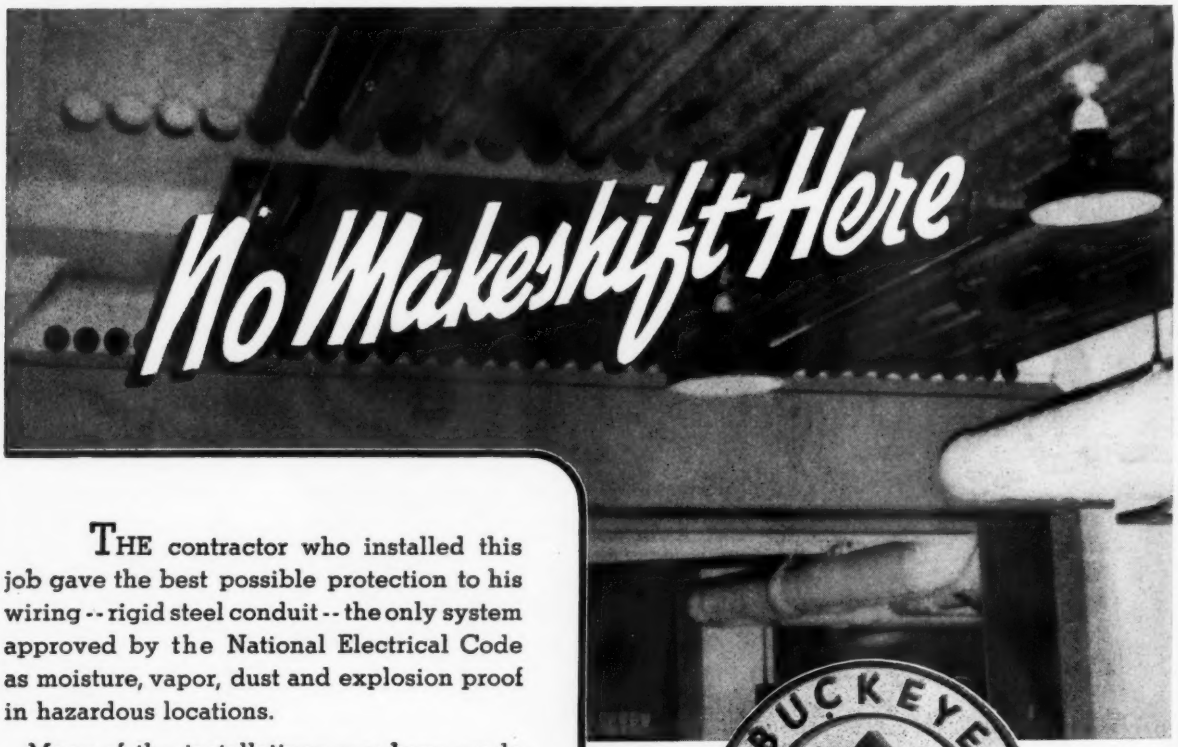
3608

Follow THIS line of SOUND reasoning

2
+2
4

when you talk to ARCHITECTS or OWNERS

FOR SAFETY'S SAKE . . . USE CONDUIT *(Full Weight Rigid Steel)*




THE contractor who installed this job gave the best possible protection to his wiring -- rigid steel conduit -- the only system approved by the National Electrical Code as moisture, vapor, dust and explosion proof in hazardous locations.

Many of the installations you have made in wartime are necessarily of an emergency nature. There just isn't enough steel conduit to go around. But the time is not far distant when you will no longer need to depend on makeshift methods and substitute materials.

So when you start rewiring those reconversion jobs, as well as installing new systems for new peacetime plants, plan to use dependable Youngstown Buckeye Conduit -- America's standard wiring protection for more than 30 years.

BUCKEYE TRADE MARK YOUNGSTOWN CONDUIT

YOUNGSTOWN
THE YOUNGSTOWN SHEET AND TUBE COMPANY
YOUNGSTOWN, OHIO
Manufacturers of
CARBON - ALLOY AND YOLOY STEELS

Ask your distributor for:
Youngstown Buckeye Conduit...Pipe and Tubular Products ... Sheets ... Plates ... Electrolytic Tin Plate ... Bars ... Rods ... Wire ... Nails ... Tie Plates and Spikes

# NEW "MITCHELITE"

## ALL-STEEL

## INDUSTRIAL FLUORESCENT FIXTURES

*Engineered for*

**Rugged Durability**

★

**Greater Mounting Flexibility**

★

**Easier Lower-Cost Maintenance**

★

**Unexcelled Lighting Performance**

**9 STAND-OUT FEATURES**

1. RIGID ALL-STEEL REFLECTORS AND WIRE-WAYS FOR LONG SERVICE
2. OPEN-END AND CLOSED-END TYPES IN 2-40, 3-40 AND 2-100 WATT MODELS
3. CHOICE OF BAKED ENAMEL OR PORCELAIN ENAMEL FINISH
4. AIRCRAFT-TYPE "INSTANT-LATCH" —QUICKLY RELEASES REFLECTOR
5. EASILY JOINED END-TO-END FOR CONTINUOUS ROW LIGHTING
6. ACCESSORIES FOR EASIER, QUICKER MOUNTING OR HANGING
7. NEW, PERFECTED "INSTANT-START" AVAILABLE ON 2-40 WATT MODELS
8. U.L. AND E.T.L. APPROVED THROUGHOUT
9. UNEXCELLED LIGHTING PERFORMANCE —MEETS E.T.L. REQUIREMENTS

PRIORITY: AA-3 for new lighting projects. AA-2 under MRO.

MITCHELL FLUORESCENT

*Get full details from your MITCHELL DISTRIBUTOR or write for Catalog No. 281.*

**MITCHELL** *Manufacturing Co.*

2525 N. CLYBOURN • CHICAGO 14, ILLINOIS

# These Ducts
## HAVE WHAT IT TAKES
### —for reliable cableway service

**Here are some outstanding reasons why J-M Transite Conduit and Korduct serve so well under the most severe conditions—**

**Inorganic** . . . made of an asbestos and cement composition which provides permanence and strength, makes the ducts immune to rust or rot.

**Permanently smooth bore** . . . long cable pulls and replacements are made easier. Danger of damage to cables is minimized.

**Easily and quickly installed** . . . long, light-weight lengths and simple assembly method assure rapid, economical installation.

**Immune to electrolysis** . . . being entirely inorganic and non-metallic, these ducts are not affected by electrolytic or galvanic action.

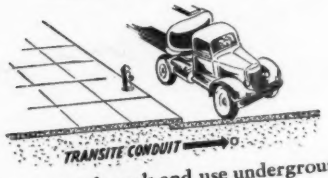
**Lower cable temperatures** . . . an advantage resulting from a relatively high rate of heat dissipation.

**Incombustible** . . . won't contribute to the formation of dangerous smoke, gases, or fumes. If burnouts do occur these inorganic ducts provide maximum protection to adjacent cables and permit easy removal of damaged conductor.

* * *

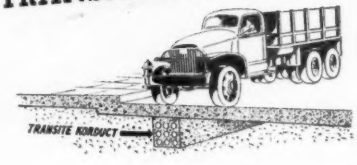
For complete details on Transite Ducts, write for Data Book, DS-410, Johns-Manville, 22 E. 40th St., New York 16, N. Y.

**TRANSITE *CONDUIT***




For exposed work and use underground without a concrete encasement.

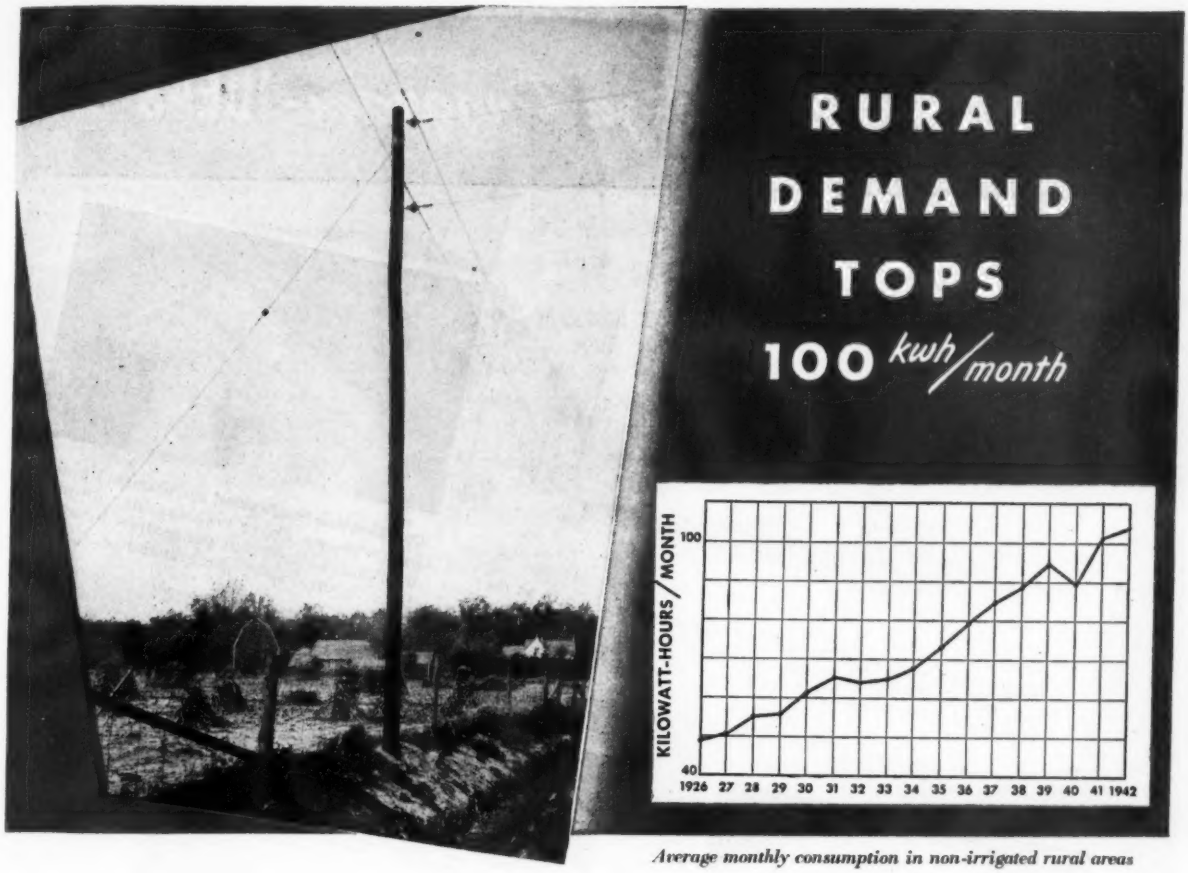
**TRANSITE *KORDUCT***




For installation in concrete. Thinner walled but otherwise identical with Transite Conduit.

JM PRODUCTS

**JOHNS-MANVILLE *TRANSITE DUCTS***




*Average monthly consumption in non-irrigated rural areas*

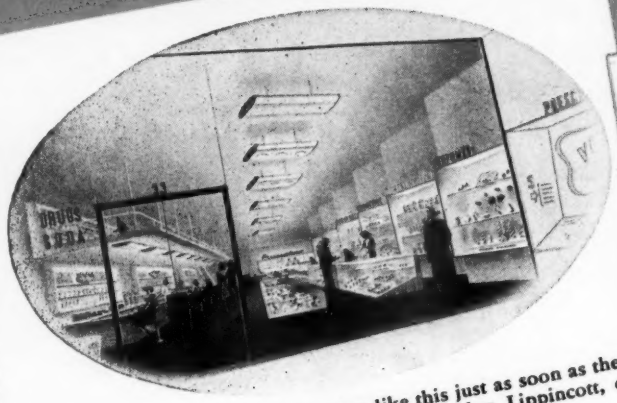
Climbing from less than fifty kilowatt-hours per month in 1926 to well over a hundred today, rural power consumption promises to hasten obsolescence of even the latter figure. For, included in that average are many young rural lines, whose customers have not been able to equip themselves with electrical appliances since the war began. Others are just becoming accustomed to having electrical help at hand.

Purchasers of Aluminum Cable Steel Reinforced will recall that Alcoa engineers have always preferred not to recommend conductors smaller than Number 4 A.C.S.R. Alcoa's supervisors, close to the feel of things in the field, prophesied that farm operators would adopt electrical help eagerly. Low conductivity wires would limit the power they could take from their lines.

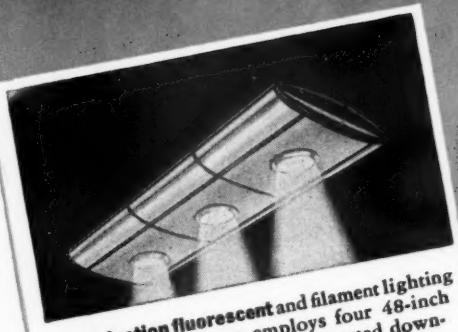
Consult with Alcoa engineers on the sizes of A.C.S.R which will provide current-carrying capacities permitting future load expansion. A.C.S.R. has the high strength and durability required in modern line construction. ALUMINUM COMPANY OF AMERICA, 2164 Gulf Building, Pittsburgh 19, Pennsylvania.

ALCOA A·C·S·R

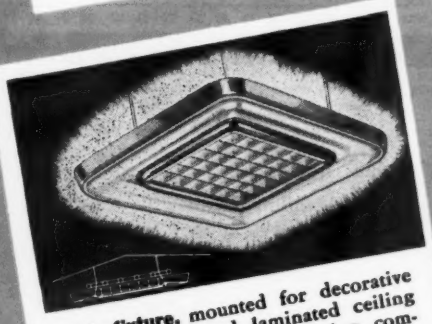
# From G-E's Design Program—IDEAS OF



**Drug stores** want modern lighting like this just as soon as they can get it. Plan and fixture are by J. Gordon Lippincott, of Dohner & Lippincott, New York.

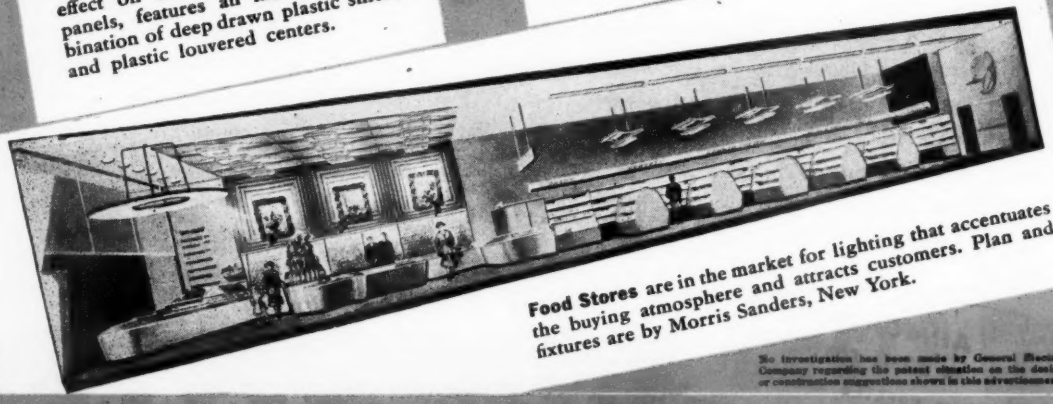


**Combination fluorescent** and filament lighting fixture shown above employs four 48-inch fluorescent lamps plus concentrated down-lighting on displayed merchandise.



**This fixture,** mounted for decorative effect on coffered laminated ceiling panels, features an interesting combination of deep drawn plastic shields and plastic louvered centers.

**This luminaire** combines light for general ceiling illumination and concentrated light that highlights display surfaces. The canopy is low-pressure molded plastic; lower part is translucent plastic.



**Food Stores** are in the market for lighting that accentuates the buying atmosphere and attracts customers. Plan and fixtures are by Morris Sanders, New York.

No investigation has been made by General Electric Company regarding the patent situation on the design or construction suggestions shown in this advertisement.

**GENERAL ELECTRIC**

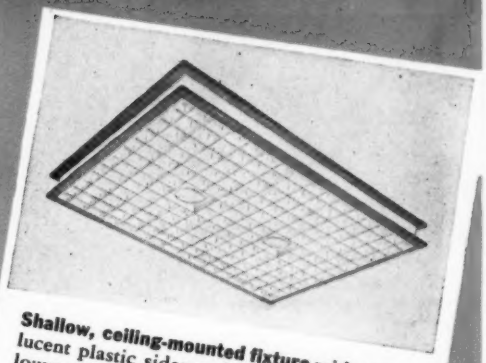
*Hear the General Electric radio programs: "The G-E All-Girl Orchestra", Sunday 10 p. m. EWT, NBC; "The World Today" news, every weekday 6:45 p. m. EWT, CBS.*

# LEADING DESIGNERS ON POSTWAR FIXTURES

TODAY, almost 1,500,000 stores in this country need relighting. To help you bring them the full benefits of modern lighting, General Electric is commissioning leading architects and designers to work out ideas for new and more attractive lighting fixtures. Seventeen of these men are now at work on this program. Several of their ideas are illustrated here. More of them will be ready soon.

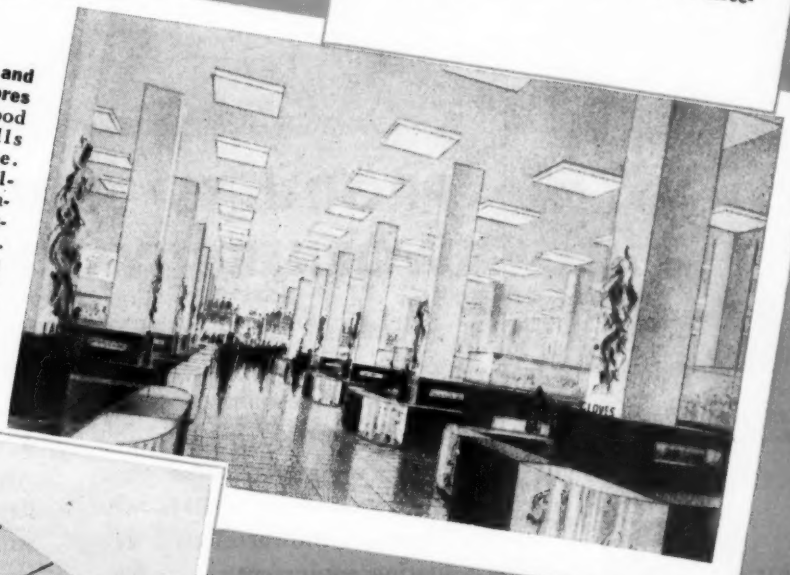
From these original designs, fixture manufacturers are already working on new lighting tools that will help you get a full share of postwar lighting profits.

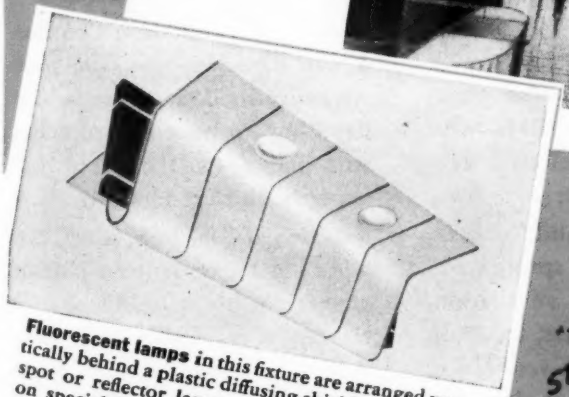
**ILLUSTRATED BOOKLET** *describing G-E's design program is now available. Write for Booklet Y-467, General Electric, Nela Park, Cleveland 12, Ohio.*



**Shallow, ceiling-mounted fixture** with translucent plastic sides and "egg-crate" plastic louvers for light diffusion. Two spotlight housings in center are adjustable for directional lighting.

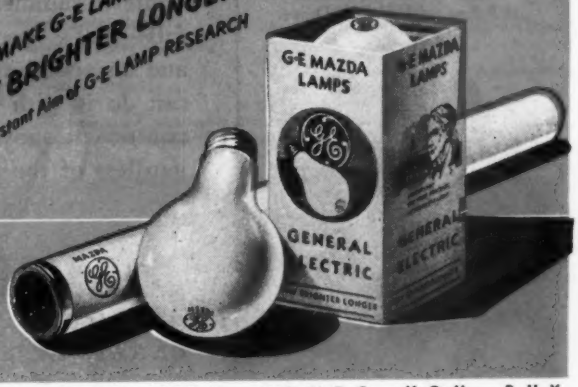
**Department and Specialty stores** know that good lighting sells merchandise. Thousands already have complete modernization programs. Plan and fixtures shown here are by Graham, Anderson, Probst & White, Chicago.





**Fluorescent lamps** in this fixture are arranged vertically behind a plastic diffusing shield. Adjustable spot or reflector lamps may be readily directed on special merchandise displays.

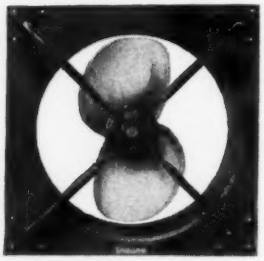
"TO MAKE G-E LAMPS STAY BRIGHTER LONGER"
The Constant Aim of G-E LAMP RESEARCH



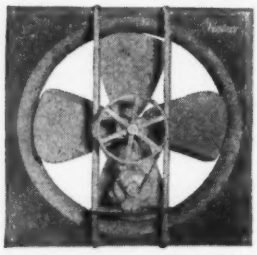

## G-E MAZDA LAMPS

KEEP BUYING WAR BONDS — KEEP THE WAR BONDS YOU BUY

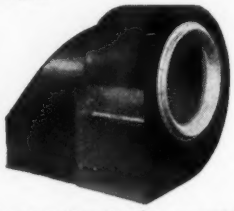
AMERICAN BLOWER



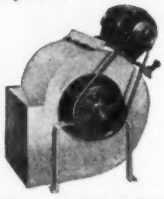
*Ventura Fan with direct connected 2-speed fully enclosed motor.*



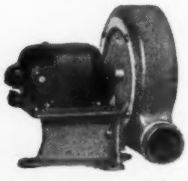
*Ventura Fan with V-Belt Drive.*



*ABC Utility Set for use with duct system.*



*ACF Fan with V-Belt Drive.*



*Type P Pressure Blower.*

ARMY-E-NAVY
For Excellence in Production

# PRODUCTS THAT KEEP WAR WORKERS "WALKIN' ON AIR"

We venture to say that there are no less than a million good reasons for the success of America's war effort.

One way to keep war workers "walkin' on air" is with American Blower electric ventilating equipment.

"Give 'em air," and lots of it, winter, summer, spring and fall—that's good ventilation, and it's good business, too. You can do it with the ventilating equipment shown on left. Regardless of the process or purpose, there's a type and size of American Blower equipment to meet the problem exactly.

And the Ventilating Contractors of America—the same men who furnished and installed air handling equipment in so many war plants—will do your job expertly and economically.

If it's a war job, they can handle it today. If it's a part of your postwar planning, they'll be ready to do the job with American Blower equipment as soon as peacetime production is resumed. Remember, "good ventilation is good business."

**AMERICAN BLOWER**

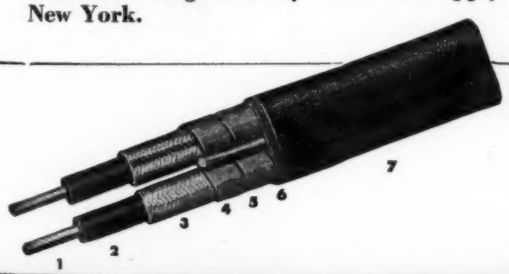
AMERICAN BLOWER CORPORATION, DETROIT, MICH.
CANADIAN SIROCCO COMPANY, LTD., WINDSOR, ONT.
Division of AMERICAN RADIATOR & Standard Sanitary CORPORATION

**Though this is but one of many large war projects in which Walkerflex has been used, it is an outstanding job for several reasons other than size. The cable had to be so flexible that sharp bends could be made without cracking. Installation time had to be saved. The free stripping and easy handling qualities of this cable make this possible, for Walkerflex does not get sticky in hot weather, nor does the outer covering flake off. There were also other reasons for the selection of Walkerflex, some of which are named in the seven construction features listed below.**

**The engineers on this project were Tuttle, Seelye, Place & Raymond, New York; electrical contractors were Spitzer Electric Company, New York; and the material was distributed through Midway Electrical Supply Company, Inc., New York.**

**WIRE WITH WALKER**

**STUDY THESE 7 CONSTRUCTION FEATURES**




1. Tinned copper conductors
2. Free-stripping insulation
3. Tough braid of cotton and paper fibres
4. Multi-fold kraft paper armor
5. Moisture-proofed jute cord
6. Paper sheath—keeps compounds from penetrating interior
7. Outer braid, treated to resist moisture, retard flame

**Ask your local wholesaler about prices and deliveries. For further information, write to Walker Bros., Conshohocken, Pa.**

**WALKER Conshohocken**

# Electrical Wiring is Basic!

**That's why Anaconda's national advertising drive is important to every electrical utility**

ANACONDA's advertising campaign is aimed at creating a sounder basis for your postwar business. It urges postwar planners to allow extra capacity in wiring plans. It puts the spotlight on the big increase in the demand for power and equipment sure to come.

Don't overlook the opportunity to tie in with this special campaign. Plan now to get a maximum share of its benefits. Link your own promotion to your local adequate wiring bureau activities and Anaconda's basic advertising theme: It's always wiser to Wire Ahead! 44262

**BUY MORE WAR BONDS**

Know where that postwar plan of yours ought to START?
THINK AHEAD Electrically
How many "VICTORY" JOBS will result from
increased use of Electric Energy
ANACONDA WIRE & CABLE COMPANY
Electrical Wires and Cables of Copper are the Life Lines of our Nation

Full-page Anaconda advertisements running regularly, in color, in Time, Newsweek, Business Week, and a list of industrial publications reaching America's leading postwar planners.

ANACONDA

## ANACONDA WIRE & CABLE COMPANY

25 Broadway, New York 4 . . . Sales Offices in Principal Cities

*Electrical Wires and Cables of Copper are the Life Lines of our Nation*

# ELECTRICAL SOUTH

VOL. 24 SEPT. 1944 NO. 9

T. W. McALLISTER, *Vice Pres., Editorial Director*
CARL W. EVANS, *Editor*
BARON CREAGER, *Southwestern Editor*
J. C. MARTIN, *Business Manager*
W. E. COOGLER, *Production Manager*


## In This Issue


| | |
|---|---|
| Tune Up Lighting for All-Out Production | 13 |
| Basic Concepts in Lighting System Design | 17 |
| Spotlighting the Postwar Lighting Market | 20 |
| Regular Maintenance Prevents Lighting Depreciation | 24 |
| Lighting for Magnification | 28 |
| Field Test Proves Value of Maintenance | 30 |
| Light Meter Progress Keeps Pace with Industry | 31 |
| Appliance Schools Produce Trained Mechanics | 33 |
| Large Postwar Market Indicated for Home Freezers | 38 |
| How Regulations Affect Radio Servicemen | 40 |
| Simplifying Power System Layouts—Part 2 | 42 |
| News of the Electrical Industry | 54 |
| Government News and Views on the Industry | 70 |
| Personal Notes About Men You Know | 74 |
| New Electrical Equipment and Materials | 83 |



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**Member A. B. P. — A. B. C.**

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W. A. McGEE, Post Office Box 562, Charlotte, N. C. Tel. 3-4932.

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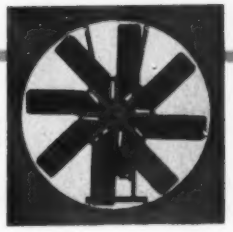
SOUTHERN POWER & INDUSTRY — SOUTHERN HARDWARE



TAKE ORDERS *NOW*
for future delivery

Coolair TRADE MARK
EXHAUST FANS and BLOWERS



Active dealers and distributors are continuing to solicit customers and *sell* orders for Coolair Fans and Blowers every day . . . and shipments are being made in a reasonable length of time.

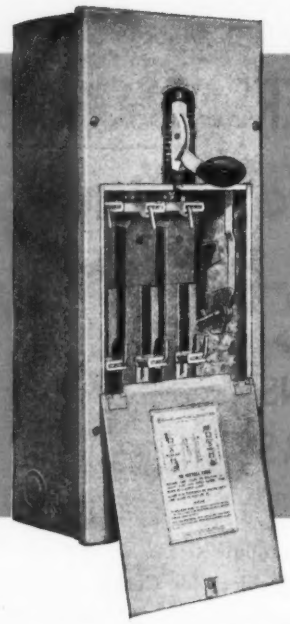
CONTACT ALL PROSPECTS NOW

- because—CMP Regulations permit almost any type of business, able to certify that the equipment they order is necessary to the successful operation of their business, to assign their own preference ratings on purchases up to $500. Form WPB 541 (Formerly PD-1A) can be filed for orders in excess of $500.
- because—many Government orders are still available to wide-awake dealers who keep in touch with these prospects.
- because—by selling your customer on an "order first—shipment first" basis, he will be assured of as prompt delivery as possible.

DON'T DELAY — START TODAY . . . contacting every likely prospect. We will be glad to help you with any priority problems that may arise. Send for a supply of the latest Coolair literature and the 1944 price list.

A full description of the Coolair line, with tables showing models, dimensions, performance data, etc., can be found in
SWEET'S CATALOG A.S.H.V.E. GUIDE
ELECTRICAL BUYER'S REFERENCE

AMERICAN COOLAIR CORPORATION . . . Manufacturers
3604 MAYFLOWER STREET
JACKSONVILLE 3, FLORIDA



# Current "ON"— hands "OFF" live contacts

The switch must be OFF before the door can be opened. Thus, protection against live parts is assured by the Type A

## SHUTLBRAK SWITCH

These switches may be used singly — banked in groups — assembled in well-designed switchboards or panelboards — or installed as plug-in units on Ⓕ Busduct ... On motor circuits — at service entrance — or on installations requiring an operating switch — they give efficient dependable service.

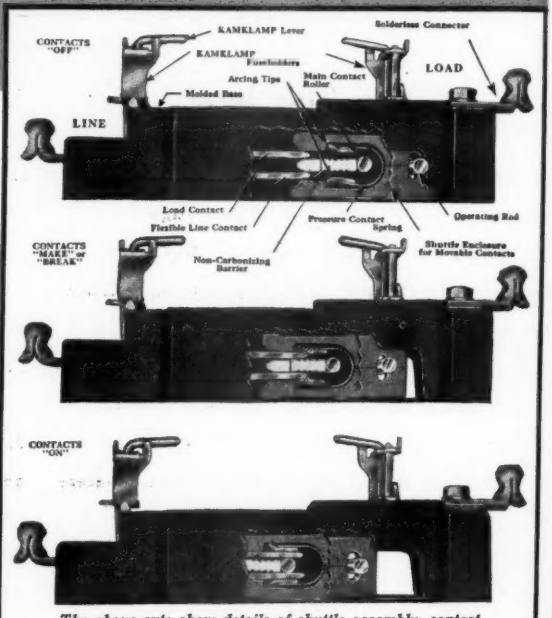
The Ⓕ Shutlbrak Switch is unique in that the contacts are *shuttled* on and off — with the roller type main contact and the auxiliary contacts enclosed in an insulated shuttle. This shuttle assembly, in turn, is entirely surrounded by insulating material.

Ⓕ Kamklamp (pressure type) Fuseholders take either ferrule or knife-blade types of fuse terminals. The new Ⓕ Solderless type Pressure Connectors assure perfect contacts.

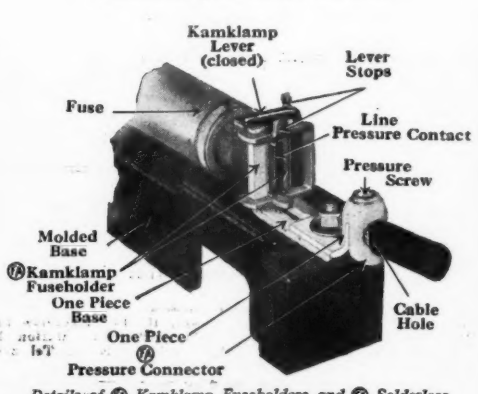
Capacities: 30 to 1200 amperes, inclusive, for 250 volts AC or DC, and 575 volts AC, in 2, 3 and 4 pole types ... Approved by Underwriters' Laboratories, Inc.

***For detailed information***

and suggested specifications for Ⓕ Shutlbrak Switches, Switchboards and Panelboards, write for illustrated Bulletin 70 ... Frank Adam Electric Company, Box 357, St. Louis (3), Mo.




*The above cuts show details of shuttle assembly, contact design, and Ⓕ Kamklamp Fuseholders.*




*Details of Ⓕ Kamklamp Fuseholders and Ⓕ Solderless Type Pressure Connector.*

**Frank Adam**
**ELECTRIC COMPANY**
**ST. LOUIS**

# Tune Up Your Lighting For "All-Out" Production

By Alan W. Larson*

AS OUR WAR-PLANT building program nears completion, more and more thought is being given to taking "inventory" of the knowledge gained. Important in the stupendous accomplishments of the past three years is the role played by lighting, for experience in its application prior to the war proved it to be a vital "tool" in our factories. Therefore, providing adequate lighting in the new war plants was accepted as a necessity. Those who had the responsibility of coordinating the use of materials in construction and production realized the advantages of good lighting. These are summarized as follows:

**1. Increased production through improved visibility, reduced spoilage, and better morale.**

**2. Protection to the worker's eyes, by reducing eyestrain.**

**3. Reduction of accidents. Since 80% of the actions of a workman are visually controlled, he must see quickly and accurately to avoid accidents. It has been estimated that 25% of all industrial accidents are attributed to improper lighting. (See Figures 1 and 2.)**

With the development of new lamps and fixtures, the real benefits of lighting progress can be reaped by industrial plants if a little more study of lighting application is given by the responsible people. A prime requisite in evaluating an installation is to determine from the type of work "what and how" the worker must see to perform his tasks.

It is all too common to find plants operating "as usual" and not interested in considering any changes. "If it has worked for 15 years this way, why change it?", is a common response. Plants of this type and plants that have not "tuned-up" their lighting eventually will be forced to improve their lighting in order to keep in step with the modern plants built during the war. Therefore, reconversions should entail surveys of the present lighting systems, for even the most recent installations may be improved by slight rearrangement of fixtures or installation of additional units. Either case depends upon the use of the machinery or work areas, and any changes that take place.

To accomplish this, it is essential to have an understanding of several fundamental factors for evaluating any lighting installation:

**1. Quantity of Illumination.** The unit of measurement of illumination is the footcandle. Portable instruments of many types are avail-

*Lighting Engineer, Westinghouse Electric & Mfg. Co., Cleveland, Ohio.

**Fig. 1. (Left) This foundry before relighting is typical of inadequate lighting. The "dungeon-like" surroundings encourage accidents, for workmen may not see hazards in time to avoid them. Fig. 2. The same foundry as in Fig. 1 after relighting. Although the work here may be classified as rough work, the workmen can operate more efficiently and safely with good visibility. Improved lighting will pay its own way up to a certain point.**

able which can be used intelligently by most individuals. Proper quantity of illumination for general and supplementary lighting must be provided to obtain the speed of vision most practical for the visual task involved. Footcandle tables based on different seeing tasks are available and should be used for checking present or for designing new installations. Tables are provided in the A.S.A. Standards, entitled "The American Recommended Practice of Industrial Lighting," prepared and published by the Illuminating Engineering Society.

While too much emphasis cannot be placed on the amount of illumination required, the quality, which is determined in the following paragraphs, is of equal importance.

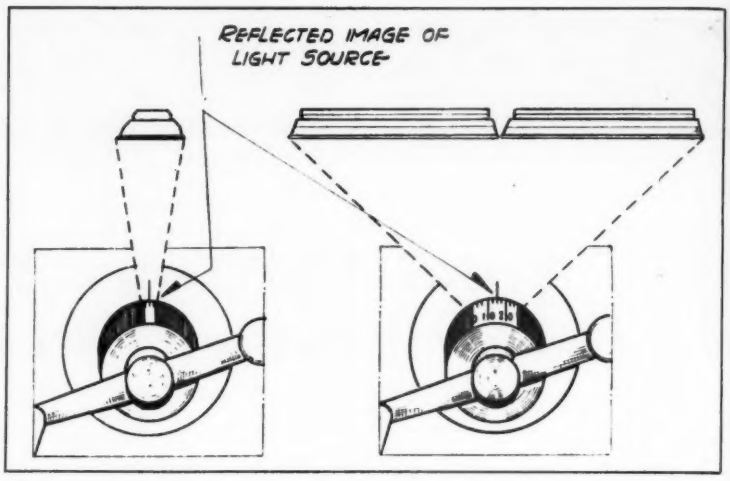



**Fig. 4. (Left) Reflected images of fluorescent luminaires on machine dials result in narrow streaks when luminaires are mounted parallel to axis of rotation of the dial. Visibility is poor for the numbers are not clear and the bright streaks usually do not appear at the index line. Fig. 5. Fluorescent luminaires mounted normal to axis of rotation of the dial provide best visibility as the graduations are seen against the wide luminous band which is the reflected image of the fixture.**

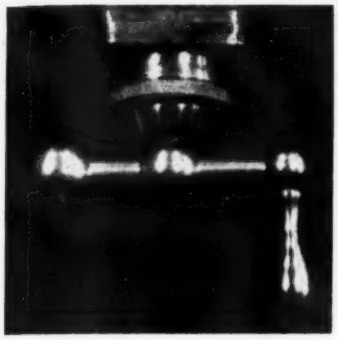
2. **Minimize Direct Glare.** "Light out of place" is a simple way to define glare whether it is direct or reflected. The presence of a glare source will cause discomfort to the eye and results in fatigue. If the glare source is within the angle of vision, the eye will try to adapt itself to the glare source and at the same time adjust itself to the brightness of the object the workman is trying to see. This fighting action in the eye continues while the workman is carrying out the task and it will not take long for him to become less efficient.

3. **Eliminate Reflected Glare.** Reflected glare is the reflected image of the light source within the angle of vision and usually comes from the surface the workman tries to see. This can be more annoying and harmful than direct glare. Reflected glare can be eliminated by positioning the fixtures with respect to the machines and work benches, or vice versa.

4. **Distribution of Light.** The light intensity throughout the general areas should be uniform for maximum visual comfort. If only one fixture is mounted near or above the work area, the operator will be viewing the objects that have a relatively high intensity compared to the non-lighted background. This contrast reduces the speed of vision and is again a case of glare causing discomfort to the eye. It is for this reason that a uniform general lighting system is necessary and should be designed to provide sufficient intensity at the work area. "Spotty" illumination will result when the spacing is too wide in comparison to the mounting height. For fixtures that have diffused reflecting surfaces, the spacing to mounting height ratio should not be more than one.

5. **Eliminate or Soften Shadows.** Poorly diffused light results in shadows of objects in the work area. Overhanging parts on machines can often cause shadows on the most critical working surfaces, making it difficult for the operator to see clearly. Even with a good general lighting system, shadows may exist. In this case, some form of supplementary light-

**Fig. 3. Even in steel mills, high intensity lighting is required for certain areas. This "slab conditioning" area has an average maintained illumination of 50 footcandles provided by 3,000-watt mercury vapor and 1,000-watt incandescent lamp luminaires. Both are mounted approximately 45 feet above the floor.**



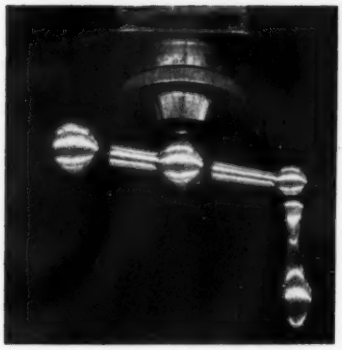


**Fig. 6. (Left) This dial is lighted as shown in Fig. 4. Note the narrow light streaks and how impossible it is to read the dial setting accurately. Fig. 7. Same cross feed dial, as in Fig. 6, under general lighting system having continuous rows of RLM fluorescent units running normal to axis of rotation of the dial as shown in sketch of Fig. 5.**

ing may be necessary to build up the intensity at critical points.

6. **Installation Efficiency.** The overall result should be the criterion for grading the efficiency of any lighting installation. This depends on the efficiency of the fixture, obstructions in the area, and reflections from surrounding surfaces. One of the most important factors too often neglected is the proper use of paint. Light colors reflect most readily and should be used wherever practical. As an example, in a room 20 feet wide, industrial diffusers with 300-watt lamps were installed at a mounting height of 10 feet. Tests have shown an increase of 23 per cent illumination when the walls were painted light, compared to the previous dark color.

7. **Supplementary Lighting.** In the design of lighting installations for the new war plants, lighting engineers were confronted with the problem of making layouts where no indication was given regarding the location of the machines involved. Naturally, a practical general lighting layout was the only answer. This resulted in areas having more critical seeing tasks than expected, and the general illumination would be lower than required for these specific areas. If the designer fortunately looked ahead to this possibility and made it simple to add fixtures, the problem became easy. Even with adequate general lighting many machine and bench operations require specific attention from a lighting standpoint.

Since the advent of fluorescent lamps, lighting problems have been solved satisfactorily that previously had been considered impractical. The accuracy of a machine shop operator of an engine lathe, for instance, depends upon his ability to read scales and dials on the machine and his portable measuring instruments. With the conventional type incandescent lamp reflectors, good visibility cannot be assured as the operator must see cut numbers and divisions on semi-polished surfaces. This can be accomplished to best advantage when the background is uniformly bright, in which case the surface acts as a mirror by imaging the light source to provide the brightness that the operator sees in contrast to the clearly visible graduations.

If a large area, low brightness light source is used these requirements would be fulfilled. Fixtures of this type are relatively inefficient and impractical. If mounted directly over the machine, the fixtures for many operations will be in the way. Therefore, they have not been used extensively.

Fluorescent fixtures have been often called "large area, low brightness light sources." This is

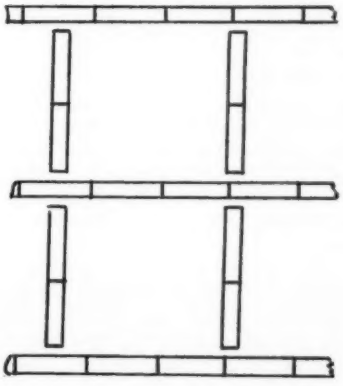
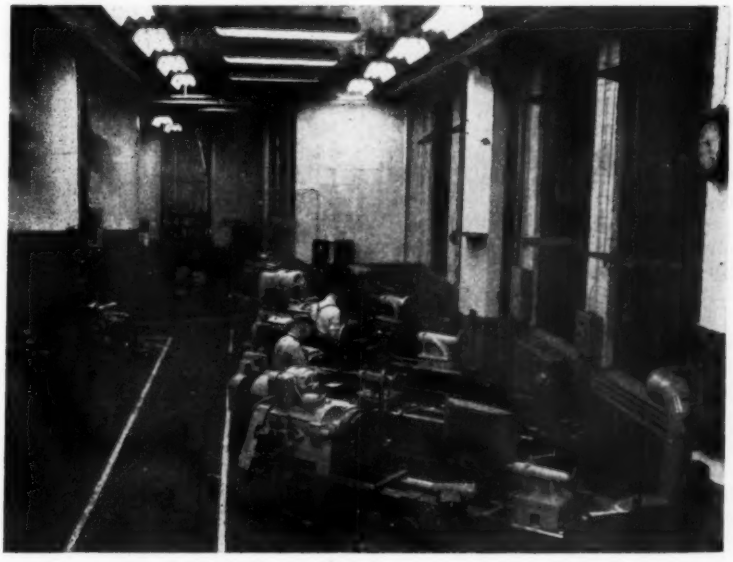


**Fig. 8. (Right) Typical layout of "grid system" two-directional mounting of fluorescent luminaires, which eliminates the objectionable line-shadows and provides best visibility on machine tool dials, micrometers and scales. This layout also is ideal for drafting rooms where it is necessary to use direct lighting. Fig. 9. (Below) "Grid system" installation of two 100-watt lamp fluorescent units mounted 15 feet above the floor provided average intensity of 70 footcandles at the tool point of lathes after 200 hours burning.**



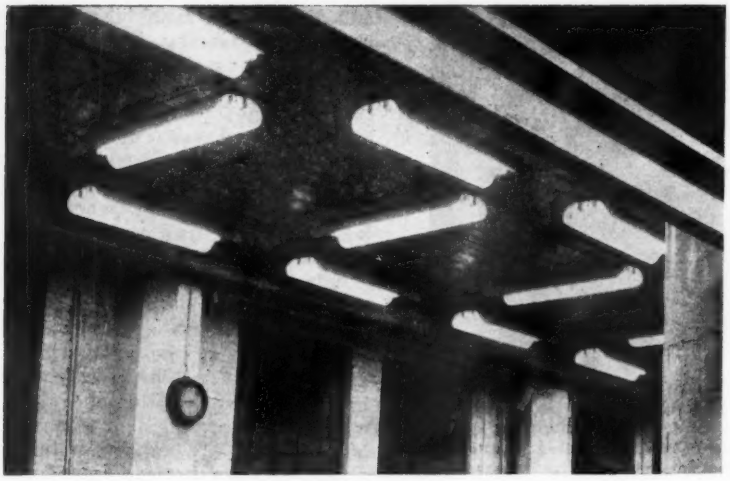


**Fig. 10. Ceiling view of "Grid system" layout of Fig. 9. Note z-pattern of fixtures when viewed in this position.**

not wholly correct since the length of the reflector is generally four times the width. Actually, they should be considered as "extended light sources." In the case of reading cylindrical dials, the position of the fluorescent fixture, with respect to the axis of rotation of the dial, is very important. Figures 4 through 7 clearly show how the width of the brightness band, which is needed for good visibility, varies with the fixtures parallel to and normal to the axis of rotation of the dial.

Engine lathes have many dials, and of major importance is the compound feed dial. This dial's position may be revolved through an arc of 180°. The brightness or image band with fluorescent luminaires, therefore, can vary from that of Figure 4 to that of Figure 5. To compensate for this condition, fluorescent luminaires mounted in two directions perpendicular to each other to form a "grid" have been used with very satisfactory results. (See Figures 8-10.) Besides improving visibility of the dials and instruments, visibility in general will be improved as objectionable line-shadows caused by uni-directional lines of light will be eliminated.

The two-direction, or grid, system is recommended for areas involving precision machining that depends on accurate reading of dials and scales; also, for areas that require elimination of line-shadows. This method is more expensive than the conventional installation, yet the special treatment is well repaid in the improvement of visibility for critical seeing.

Even with the grid system, supplementary lighting will be needed for many jobs. On lathes, for instance, boring and facing operations may require additional illumination that is more directional. This can be provided by flexible units mounted on the machine or by portable stand-lights. Whatever unit is used, it is very important that the units have reflectors that are as *large as possible* and that are *well shielded* to protect the operator from direct glare of the lamp.

Good visibility cannot be expected with supplementary lighting alone, for it is important to have with the supplementary lighting adequate general lighting mainly for two reasons:

1. To reduce contrast of brightness between that of the work area and its surroundings. The brightness of the fixture and the work will not appear as intense if the surrounding brightness is sufficient to reduce the contrast. It is easy to appreciate this fact when one considers the effect of turning on the lights of an automobile at daylight or dusk and then after dark, facing the headlights in each case.

2. The supplementary units should not be used for all jobs, as the general lighting, if adequate, will provide better visibility for many jobs other than boring or facing operations.

In areas that have isolated machines, a general lighting installa-

(*Continued on page 90*)

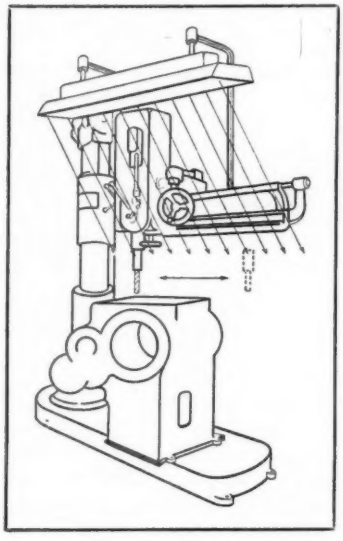


**Fig. 12. A supplementary RLM fluorescent unit mounted on the radius arm of a radial drill as shown here will illuminate the drill point, dials and controls.**

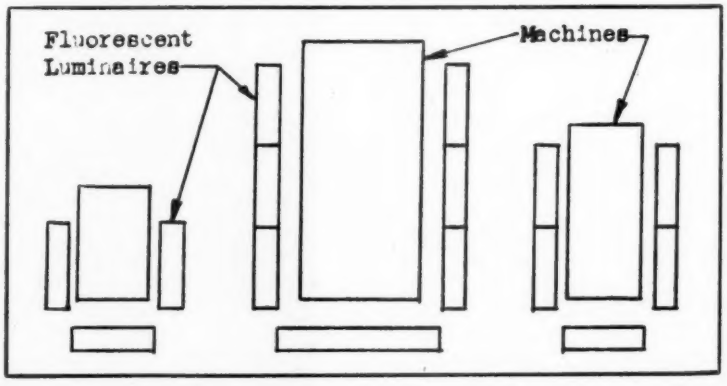



**Fig. 11. Typical "U" shaped fixture layouts for machines that need "specific" or "semi-general" lighting.**

# *BASIC CONCEPTS IN*

# Lighting System Design

By Robert R. Wylie*

THE BASIC concepts upon which modern design of illuminating areas where people work, play, live, and see are based generally upon the premise that the human eye evolved under outdoor conditions and, therefore, for the maximum human benefit, today's seeing conditions should as nearly duplicate those conditions as far as economically possible. Today we are attempting to stretch our illumination designing, our thinking, and our customers' thinking toward the lighting installation which will as nearly as possible reproduce daytime seeing conditions.

With the advent of the fluorescent lamp, we had available a source which could be economically applied in a great forward step in the achievement of this result. Unfortunately, a great many lighting salesmen, engineers, and customers took the attitude that the fluorescent lamp would be a means of saving in the consumption of power, and the resulting installations made no improvement in seeing conditions, many times giving the contrary results.

In the fluorescent lamp we have a light source which, when applied judiciously, will fill quite a few of the requirements for the achievement of the ultimate in seeing conditions. The lamp has a low luminosity, comparable to that of the sky. It has a high luminous efficiency. It has many practical applications in so far as color control is concerned, and being an extended light source, lends itself admirably to the design of an installation which can closely approximate nature's conditions in appearance.

In the illumination engineer's attempts to build toward this natural lighting effect, he has been aided by the human eye's natural accommodation to light intensity variations. Although the eye evolved under thousands of footcandles of illumination, it has proved to be a remarkably facile instrument at lower levels of illumination. The natural response curve of the eye's ability (Figure 1) to see under different levels of illumination is one which is roughly logarithmic. It is about twice as easy to see at 100 footcandles as it is at 10, but if the illumination is increased to 1000 footcandles, the ease in seeing is only increased by about 1½ times the ease in seeing at 100 fotcandles. Easier seeing, as represented by lessened fatigue, greater productivity, better morale, etc., varies in response, roughly, to this mathematical law. For easier seeing in offices, stores, homes and places where intensive concentration of detail is not required, where seeing printed materials and objects is required, it becomes apparent that recommended levels of illumination used in practice today are a large step forward.

Since we are already on the threshold of the time where vision is beginning to receive some benefits in so far as increased efficiency because of good lighting are concerned, how then can we apply this knowledge in relighting America in the era to come? We can remember that any increased benefits to be derived from the illumination will not come from consideration of the intensity of illumination alone, but from a mature reflection on:

1. The seeing task to be performed.
2. The nature of the task—color, texture, finish, etc., of the subject.
3. Nature of the surroundings.

The old concept of piling lighting intensities here and there, with but little regard for the seeing task, is fast becoming obsolete. In many cases it has not only proved to be impractical but has been sometimes dangerous. By tailoring illumination to the task to be performed, turning one's attention from the amount of light falling upon a Photronic cell to the amount of light falling upon the human eye after being reflected from the work and

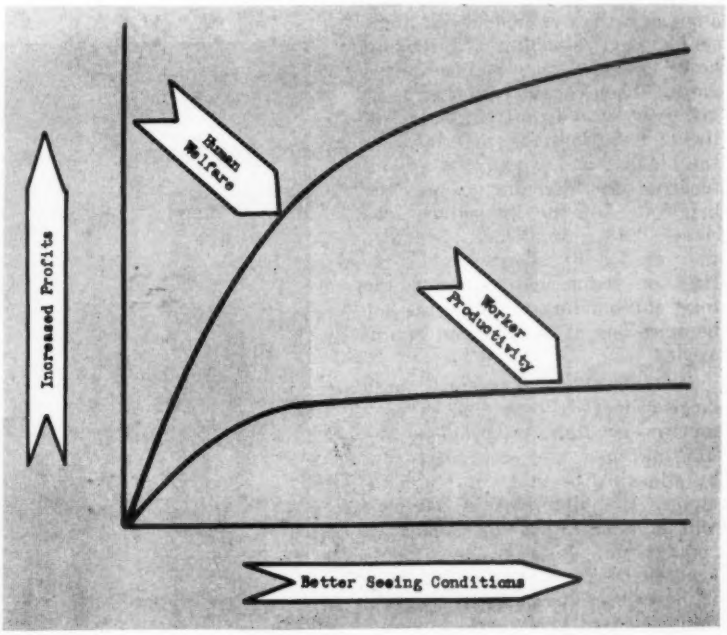



**Fig. 1. Better light means increased profits to business through increased worker productivity and improved worker morale.**

*Commercial Engineer, Sylvania Electric Products, Inc., Danvers, Massachusetts.

**Fig. 2. This convenient portable unit is used in many tight locations solving all problems in today's war plants.**

surroundings, we can arrive at a satisfactory illumination design. Care must be taken that the low brightness sources do not in themselves introduce glare into the field of vision in an eagerness to obtain high footcandle levels.

Often times lighting salesmen pile on intensity only to find that comfortable seeing is impossible because of the unusual brightness of light sources, either directly in the field of vision or by their reflected images. Correct treatment lies in the study of the problem, analyzing the position of the light source and shielding equipment, both as to direct and reflected glare. Then consideration must be given the color quality of the light, its distribution, its diffusion or specularity, and, finally, to its intensity. At this point not only the brightness of the immediate area comes into prominence, but also the relation of all objects in the field of vision accompanying the total surroundings. Thus, the job becomes one of engineering luminosities.

Possibly this may seem to be a large order to be studied at each and every lighting problem the lighting man may encounter, but by adhering to these design principles, the illumination engineer will do much to get more ready acceptance of his art, and hence greater benefits for himself than if he carelessly makes recommendations based upon more intensity "illuminations."

With even greater acceptances today of materials being made, not to plus or minus 1/8 inch but of tolerances of plus or minus 0.001 inch, anything a lighting salesman can do to bring appreciation of the accuracy of his art to a world which receives at least 80% of its sensations through vision will be a boon, not only to the engineer himself but also to his profession.

Accent lighting, the highlighting certain work or sales areas, will certainly be the order of the day in tomorrow's lighting. Coming out of the medievial darkness of World War I plants, and progressing into the modern plant with its continuous rows of fixtures with additional fixtures placed at the wall line to assure maintenance of the designed 50 or 100 foot-candles at the wall, we still find the lighting requires an additional punch at certain places. Ingenious "trouble lamps" (Figure 2), inspection light devices, (Figure 3), as portrayed in the accompanying photographs, aid the worker to see more clearly.

At the present time, in large installations, it is not economically feasible to seek the intensities which are needed for the highly precise work encountered. Figure 4, is a far cry from the bare lamp installation, representative of World War I, and supplementary lighting is aiding the eye to do more in the production of a vital war tool. In this installation, it was found necessary to add the supplementary lighting to bring the intensity up to easy seeing levels. Figure 5 shows a case where supplementary incandescent lighting is aiding a good fluorescent installation in making visibility better.

Turning to applications for store lighting, we find fluorescent being used in show cases as supplement to very well designed and well balanced general fluorescent lighting. The accompanying photographs (Figures 6, 7, and 8) show illustrations of supplementary lighting in various commercial interiors. These serve as outstanding examples of the past.

But what of the future? Judging from the trends of the past, from the releases of prominent architects, designers and lighting engineers, the building of the future will tend to be based, in so far as lighting design is concerned, on the aforegoing discussion. A factory will become a place of interest with machinery highlighted both with color and with accent illumination. The surroundings will be well illuminated, 100 footcandles will be commonplace for general illumination, and the highlighting of work areas will try to bring increased eye benefit by ascending the curve of Figure 1. The entire factory area, preferably windowless for greater economy in operation, will be 3 dimensionalized as to color scheme. The commercial

**Fig. 3. A recently developed type of inspection lighting aid used extensively in cotton mills.**

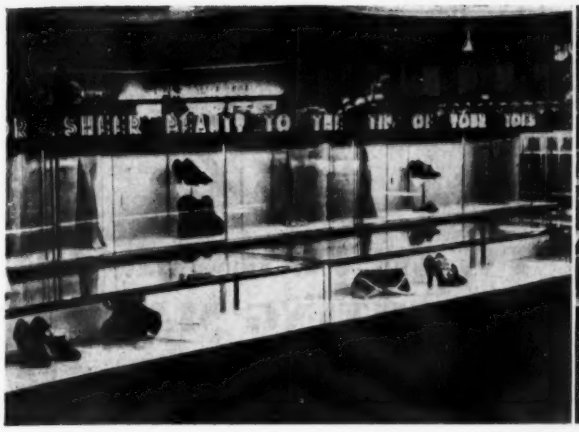


Fig. 7. General incandescent lighting installation with fluorescent strip highlighting counter sales area.

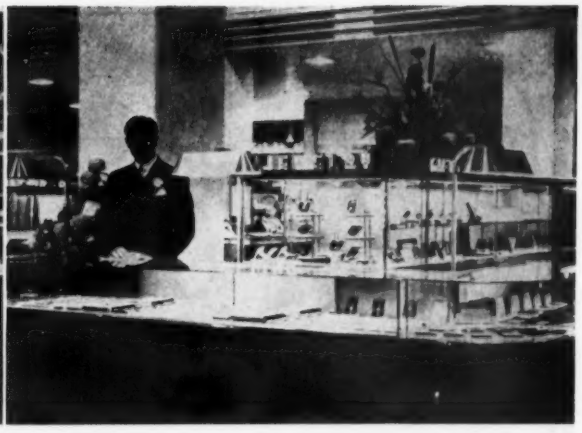


Fig. 8. Fluorescent and incandescent lighting are combined here for "attraction zone" lighting.

establishment of the future will emphasize lighting for sales, for merchants have already proved that good lighting pays huge dividends. Access lighting, with color lighting and material, will play a larger part in the store of tomorrow than even today. Realizing the benefits of higher illumination levels in producing greater profits, merchants will be forced to spotlight merchandise which they wish to move. Not only will the interior of the store require much thoughtful planning relative to its lighting, but the exterior will require as much planning. This will be especially true in those stores which do not have "visual fronts" where the interior of the store is its own advertisement. With "visual fronts" the store acts as its accent lighting.

For the home of tomorrow, we predict nothing except that eyes which are used to higher levels of illumination at work, at play, and in stores, etc., will demand that these same levels of comfortable, well-designed illumination be available at home. The modern eye, now that it can have economically the opportunity for levels of illumination which will not cause eye strain, certainly deserves them. To provide them, the engineer must attempt to reproduce the balances provided by nature when working at comparable levels.

Fig. 4 (Lower left). High intensity general fluorescent lighting supplemented by fluorescent local lighting to make a difficult seeing task easier. Note particularly the pleasant bright surroundings.

Fig. 5 (Lower right). Adequate fluorescent general lighting supplemented by incandescent local lighting on the work area. Here again note the brightness of the surroundings.

Fig. 6 (Right). General fluorescent lighting installation, with incandescent downlighting which highlights the sales area.

# Spotlighting

## THE POSTWAR COMMERCIAL LIGHTING MARKET

By H. H. Green*

| DEPARTMENT STORES | | |
|---|---|---|
| Size of Town | Average Annual Sales | Lighting Recommended |
| 100,000 and over | $221,380.00 | $11.069.00 |
| 50,000 to 100,000 | 195,430.00 | 9,771.00 |
| 10,000 to 50,000 | 126,300.00 | 6,315.00 |
| 2,500 to 10,000 | 47,740.00 | 2,387.00 |

FOR nearly four years, almost all of the utility lighting engineers and their service men, the electrical contractors and wholesalers, and many of the consulting engineers in America, have been concentrating upon the acceleration of plant production. Most of their time has been spent in the evolution of solutions for problems in industrial power and lighting. Most of their efforts have been concentrated upon a large number of individual problems in a relatively small number of plants.

When the war ends, there's a big change coming! Even at the height of our expansion for war, American industrial plants never have greatly exceeded 200,000 in number. By contrast, the market which we soon again must serve will be truly tremendous, both geographically and numerically. To the market represented by 200,000 industrial organizations, the return of peace will add more than ten times that number of commercial establishments.

During the time that the members of the electrical fraternity have spent all their days and many of their nights planning and installing better light for war workers, the commercial market has been held virtually at a standstill. The involved process of lighting war-industry for three-shift production did more than divert the major number of available lamps and lighting materials. The long hours of work involved made it almost impossible for lighting men even to call on their commercial customers, much less keep them abreast of new developments in lighting equipment and lighting technique.

One of these days, soon, everyone in the lighting industry will start out again to call on commercial prospects, help them prepare plants for postwar relighting, show them how they can use new equipment and techniques, new lighting that will aid clerks and attract customers.

There is every indication that the market will be more responsive than ever before. In every phase of the commercial field, surveys indicate great backlogs of demand. In the department store field alone, more than a billion dollars have been earmarked for modernization. One of the major improvements for which this amazing total has been budgeted, is lighting—and 84% of the operators of department stores have signified their determination to relight. It is worthy of note, in passing, that 90% of these execu-

*General Electric Company, Nela Park, Cleveland, Ohio.

**The figures under each of the illustrations are averages showing annual average sales in various retail fields and the amount of money each type and size of establishment can afford to spend on relighting. The averages are classified by size of town and will enable the lighting salesman to estimate the potential relighting business in his territory.**

●

tives express a preference for new fluorescent lighting.

There are plans for retail relighting in the food field, among jewelers, druggists and hardware merchants. New car dealers, the operators of apparel and furniture stores, all the way across the country, say that they want new lighting when peace returns. Among chain stores, surveys show that five hundred million dollars will be spent in the twelve months that will immediately follow the release of materials.

These are big figures—these nation-wide totals—and everyone in the electrical industry can take a lot of encouragement from them. Big as they are, however, none of these totals help an individual salesman to see the scope of his own individual market. Can markets be localized? Can figures be evolved to show individual markets? Are there dependable data that can show a salesman the relative importance of the towns in his territory and give him a reliable index by which to judge the variation between one class retail operation and another? Above all, the salesman needs some kind of a yardstick that he can apply to individual commercial lighting prospects.

The problems of lighting a drug store may be very similar to the problems represented by the lighting of a medium department store. The basic requirements may be exactly the same. Both retailers want to attract more customers, make more sales more easily, reduce the amount of returned merchandise. Nonetheless, there is bound to be one marked difference, that represented by the amount of money available for relighting the two types of local stores in their territories. Only then can they put first things first and call on prospects in the order of their importance.

**FOOD STORES**

| Size of Town | Average Annual Sales | Lighting Recommended |
|---|---|---|
| 100,000 and over | $19,840.00 | $ 990.00 |
| 50,000 to 100,000 | 22,170.00 | 1,108.00 |
| 10,000 to 50,000 | 23,520.00 | 1,176.00 |
| 2,500 to 10,000 | 22,700.00 | 1,135.00 |

**APPAREL SHOPS**

| Size of Town | Average Annual Sales | Lighting Recommended |
|---|---|---|
| 100,000 and over | $39,570.00 | $1,978.00 |
| 50,000 to 100,000 | 35,560.00 | 1,778.00 |
| 10,000 to 50,000 | 26,210.00 | 1,310.00 |
| 2,500 to 10,000 | 20,900.00 | 1,004.00 |

**AUTOMOTIVE DEALERS**

| Size of Town | Average Annual Sales | Lighting Recommended |
|---|---|---|
| 100,000 and over | $164,140.00 | $8,207.00 |
| 50,000 to 100,000 | 146,880.00 | 7,344.00 |
| 10,000 to 50,000 | 105,960.00 | 5,458.00 |
| 2,500 to 10,000 | 70,360.00 | 3,518.00 |

**FILLING STATIONS**

| Size of Town | Average Annual Sales | Lighting Recommended |
|---|---|---|
| 100,000 and over | $18,520.00 | $926.00 |
| 50,000 to 100,000 | 16,970.00 | 848.00 |
| 10,000 to 50,000 | 16,310.00 | 815.00 |
| 2,500 to 10,000 | 13,690.00 | 685.00 |

Everyone in the lighting business knows that better light can help attract more money from more individual shoppers. Hundreds of retailers who had modernized their lighting before the war attest that fact and hundreds of other merchants apparently are willing to accept it. Current estimates assure us that commercial customers are awaiting the return of lighting materials with great anticipation, scarcely able to wait until fixture manufacturers can complete their first postwar fluorescent fixtures. Postwar selling may be very simple, but if the retailer gets the kind of relighting he can live with, the kind that gives him the light he needs, there is a lot of selling to be done.

At some point in every presentation of retail relighting, whether the store be large or small, lighting field men will have to answer some sharp, critical questions. How much can a merchant afford to invest in better lighting? If he owns the building he occupies, if he is remodelling or rebuilding, what percentage of construction costs should be budgeted for wiring, fixturing, lamps and the labor for expert installation? If he rents, what percentage of his sales may properly be allocated for tenant changes?

Almost everyone in the electrical field is familiar with the rule-of-thumb formulas that electrical contractors have used for years. We have come to accept the fact that every lighting budget must be divided to allow half for labor and half for wiring, fixturing and lamps. Pre-war contractors allowed a minimum of 4% of building costs for electrical work. They varied their percentages for individual buildings, figuring as much as 10% to 12% for a modern theatre, 6% to 8% for a department store, bank or restaurant.

In the new commercial market, since the advent of fluorescent, the minimum figure has been set at 5% of building costs. Thus, if your commercial lighting prospect is building or remodelling a store valued at $65,000 you can safely recommend $3,250 worth of lighting equipment as an original investment. For operators who rent the buildings they occupy, tenant changes are sound economy on the basis of 5% of gross sales. If his

**DRINKING PLACES — LIQUOR STORES**

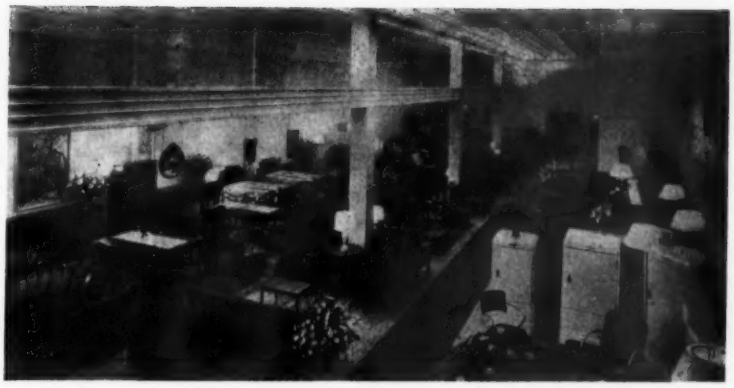
| Size of Town | Average Annual Sales | Lighting Recommended |
|---|---|---|
| 100,000 and over | $16,650.00 | $832.00 |
| 50,000 to 100,000 | 15,670.00 | 783.00 |
| 10,000 to 50,000 | 15,010.00 | 750.00 |
| 2,500 to 10,000 | 12,940.00 | 647.00 |

**DRUG STORES**

| Size of Town | Average Annual Sales | Lighting Recommended |
|---|---|---|
| 100,000 and over | $31,610.00 | $1,580.00 |
| 50,000 to 100,000 | 36,320.00 | 1,816.00 |
| 10,000 to 50,000 | 35,390.00 | 1,769.00 |
| 2,500 to 10,000 | 25,820.00 | 1,291.00 |

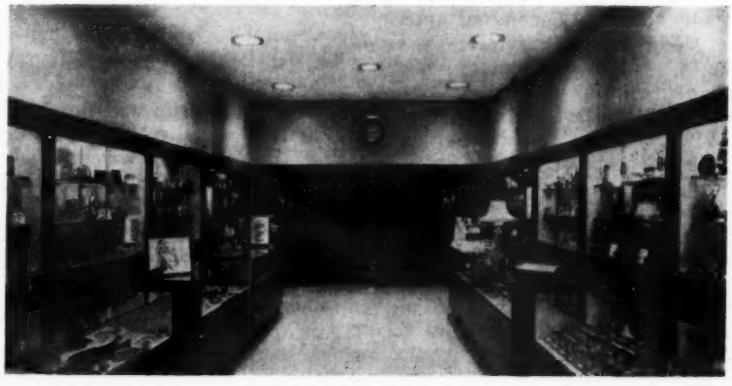
annual sales total $28,500 you can recommend, and he can afford, lighting changes that amount to $1,425.

To localize national figures, to apply them directly to the stores in his own market, the lighting salesman needs only three simple sets of figures. The first figure he needs is the number of stores in his town or territory. The second indicator he needs is an analysis of the average sales volume for each type of business represented in his market area. Then to complete his yardstick, he should have an adequate indication of the amount of relighting that he can recommend to each type of store owner or operator. Where can he get these figures? How, without access to a prospect's private files, can he establish an adequate relighting budget?



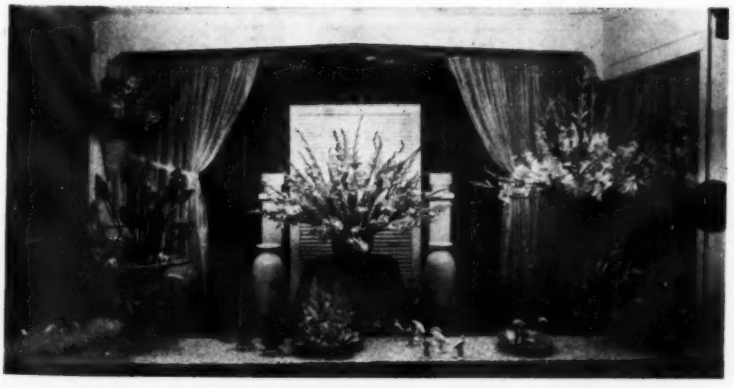
**FURNITURE-HOUSEHOLD-RADIO**

| Size of Town | Average Annual Sales | Lighting Recommended |
|---|---|---|
| 100,000 and over | $49,630.00 | $2,481.00 |
| 50,000 to 100,000 | 47,220.00 | 2,361.00 |
| 10,000 to 50,000 | 34,280.00 | 1,714.00 |
| 2,500 to 10,000 | 19,110.00 | 955.00 |



**JEWELRY STORES**

| Size of Town | Average Annual Sales | Lighting Recommended |
|---|---|---|
| 100,000 and over | $40,850.00 | $2,042.00 |
| 50,000 to 100,000 | 33,550.00 | 1,677.00 |
| 10,000 to 50,000 | 21,620.00 | 1,080.00 |
| 2,500 to 10,000 | 9,540.00 | 477.00 |



**FLORISTS SHOPS**

| Size of Town | Average Annual Sales | Lighting Recommended |
|---|---|---|
| 100,000 and over | $11,390.00 | $569.00 |
| 50,000 to 100,000 | 12,220.00 | 611.00 |
| 10,000 to 50,000 | 10,790.00 | 539.00 |
| 2,500 to 10,000 | 5,950.00 | 297.00 |

Over a period of a long number of years, big, busy, successful sales managers have appraised markets accurately by the study and application of averages. Every grocer in the U. S. reports his sales each year, as do the operators of drug and department stores, automotive dealers, hardware merchants, furniture and drug dealers. Averages are available, therefore, to show the volume of business done by all principal types of retailers, annual sales figures that can give a salesman a very specific idea of the difference between, and the relative importance of, each kind of store as a postwar relighting prospect.

These averages, although they vary slightly by town-size, can give each salesman something to shoot at, provide a sound basis upon which he can approach each type of merchant in his territory. Under each of the principal pictures with which this story is illustrated, is a typical retail relighting prospect classification. For reader convenience, averages have been broken down to fit the town-size classification and each group of figures indicates the amount of money that can safely be recommended as a lighting budget.

No salesman ever expects to sell all of his prospects, even though he may be fortunate enough to be able to call on most of them every day. But, as these figures

*(Continued on page 91)*

# Lighting Depreciation Prevented Through Regular Maintenance

By William H. Kahler*

NO LIGHTING system is any better than its maintenance. An installation may be properly designed to furnish 50 footcandles, but neglect of maintenance may quickly reduce this level 50% or more. Electrical engineers and building owners realize these facts, but what can be done to handle this ever increasing maintenance problem?

The answers are simple if maintenance is thoroughly considered during the planning period of the lighting system. All too often maintenance is forgotten until the lighting has operated several months, then a severe depreciation of illumination is noticed and workers complain of poor lighting.

First, what is meant by *lighting depreciation?* Immediately after new lighting equipment is installed, the illumination intensity begins to drop off. Reasons for this drop-off or depreciation may be caused by:

1. Lamp depreciation.
2. Dirt accumulation on luminaires.
3. Lamp outages.
4. Dirt accumulation on walls and ceiling.
5. Reduction of line voltage.

*Lighting Engineer, Westinghouse Electric & Mfg. Co., Cleveland, Ohio.

The chart below shows these depreciation factors as they affected an actual plant installation. Illumination as found had dropped to 54% of the initial level.

It is the responsibility of the lighting engineer and architect to recognize the probable existence of these depreciation factors. When designing a lighting system, allowance must be made for an overall depreciation that is likely to occur depending upon local conditions. Therefore, it is well to explain the reasons for each depreciation factor.

**Lamp depreciation** is inherent in all types of light sources. Neither the designer nor the building owner has any control over this factor. However, published lamp schedules give initial light output data and light output at 70% life. The designer should consult these schedules for data on the particular lamp he wishes to use because depreciation will vary from 10% to 20% on different lamps.

**Lamp outages** — Burned out lamps which are not promptly replaced reduce footcandles in proportion to the number of lamps out. This condition can be minimized by replacing outages promptly.

**Dirt accumulation** alone can reduce illumination 50% or more if cleaning is neglected. The designer should consider atmospheric conditions, probable frequency of cleaning and type of luminaire as it is affected by dirt.

**Dirt on walls and ceiling** will cut down illumination considerably. For indirect or general diffuse lighting systems this depreciation may amount to 10% to 20% in a year or two. The designer of the system should make some allowance for this depreciation.

**Line voltage drop** will not be a problem in a well-planned building. In inadequately wired structures, however, load may be added from time to time which will reduce line voltage. Light from incandescent lamps drops off 3% for every 1% in voltage drop.

Consideration of all of these factors for each application is important. Assuming that lighting will be properly serviced, the depreciation factors in Table I are suggested. If the designer knows that maintenance will be poor, the higher factors are recommended.

**Select luminaires for easy maintenance** — Another responsibility of the designer is selection of equipment. By keeping maintenance in mind, he will specify not only adequate equipment, but also luminaires which are practical to service. A few minimum maintenance points are:

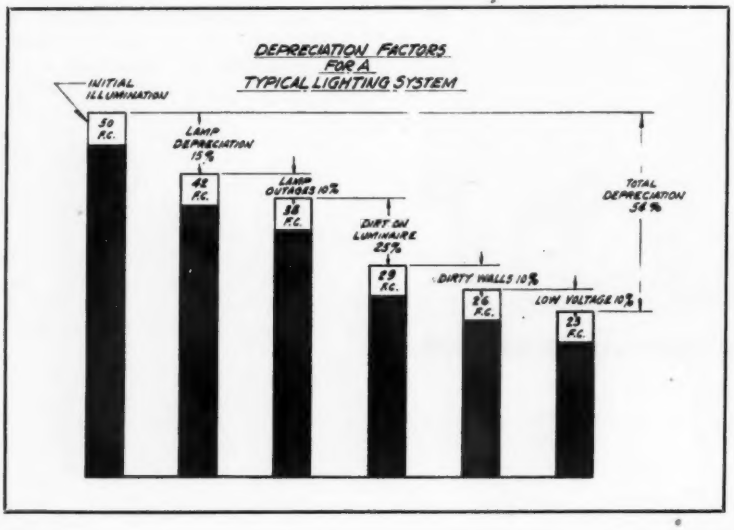
**1. Select luminaires which are easy to relamp. No tools should ever be required for relamping.**

**2. Choose reflecting and diffusing materials which are permanent and easy to clean. Porcelain enamel, glass, and Alzak aluminum are good examples of materials which retain their initial characteristics and can be readily cleaned.**

**3. Use luminaires (fluorescent or incandescent) having reflectors or glassware that can be removed for cleaning.**

**4. Install rugged, dust-tight fixtures where a severe dirt condition exists.**

**5. When designing fluorescent systems use the largest practical**



**lamp size. The 100-watt lamp has twice the light output of the 40-watt and therefore, only half as many lamps are required.**

**6. Specify no-blink starters for all fluorescent units, (either 40 or 100 watt sizes) when luminaires are in hard-to-reach locations or when flashing lamps cannot be promptly replaced.**

**7. Consider the 400 and 3,000 watt mercury lamps for high bay applications. The 400-watt lamp will burn three times as long as large incandescent lamps. The 3,000-watt lamp has a 2,000-hour life and its light output equals six 1,000-watt incandescent lamps.**

**8. Select luminaires of a reputable manufacturer.**

**Means of Access**—It is vitally important to provide easy, safe access to luminaires. If accessibility is not given careful attention, lamp changing and cleaning may be a major operation rather than simple routine. As a result, servicing of the lighting will be neglected.

No one method of access is best for every job. On the contrary, each installation should be studied as an individual case. Remember, the lighting must be serviced after the floor area becomes a maze of machines and desks and other operating equipment. A few practical means of access are listed below:

**Table 1.—Suggested Depreciation Factors**

| | Luminaire Type | Good Maintenance | Poor Maintenance |
|---|---|---|---|
| 1. | Direct fluorescent 40 watt | 30% | 40% |
| 2. | Direct fluorescent 100 watt | 35% | 50% |
| 3. | Direct incandescent (RLM dome) | 30% | 40% |
| 4. | Direct Dust-tight unit | 25% | 30% |
| 5. | General diffusing enclosing globe | 30% | 40% |
| 6. | Semi-indirect | 35% | 50% |
| 7. | Totally indirect | 40% | 60% |

1. Ladder: safety step ladder, "A" ladder, extension ladder.
2. Traveling overhead crane.
3. Lowering hangers for luminaires.
4. Crow's nest ladder on truck.
5. Telescoping portable lift.
6. Catwalks adjacent to luminaires.
7. Catwalks with luminaires arranged on trolley to be drawn to catwalk.
8. Monorail traveling crane with carriage.

### Maintenance Up-Keep

After a system is designed and installed, the first step is to set-up a maintenance schedule to insure regular cleaning and prompt replacement of lamp outages.

Cleaning every three to four months is satisfactory under average dirt conditions, while in very dirty locations cleaning may be necessary every few weeks. The cleaning frequency for a particular set of conditions can be determined by taking periodic light meter readings after the first cleaning. When footcandles have dropped 15% to 20% it is time to clean again.

**How to clean luminaires**—Lighting equipment should be washed, not just wiped off with a dry cloth. Tests have proven that thorough washing reclaims 10% to 15% more light than mere dry wiping. Also, dry wiping often

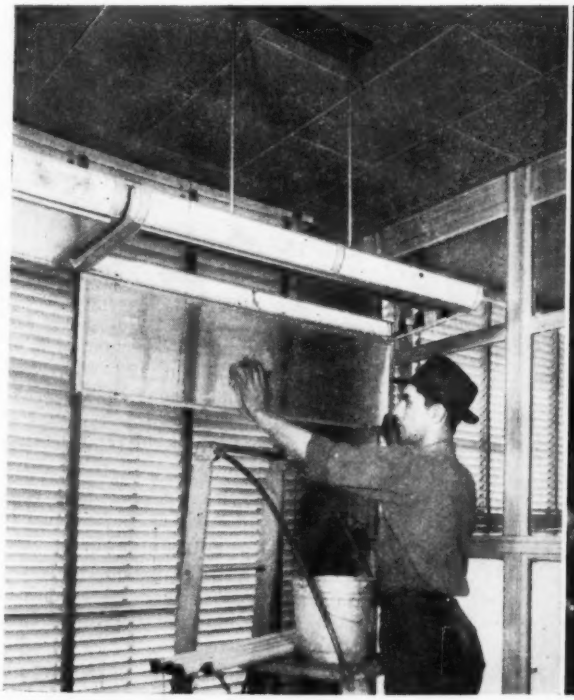


**Fig. 1. Wash luminaires thoroughly every 3 to 4 months with a non-soapy free rinsing cleaning agent.**

**Fig. 2. Clamp-on brackets attached to ladder give a workman extra "arms" for greater efficiency and safety.**

will cause grit to scratch the reflecting surface.

When reflectors or glassware can be taken down, cleaning procedure should be as follows: (1) Scrub with sponge or soft brush while immersed in cleaning solution. (2) Rinse in clean warm water. (3) Do not immerse lamp bases.

The cleaning process will be faster if a few extra clean reflectors, or pieces of glassware, are on hand. Thus, on the trip up the ladder a man can carry the clean parts and then come down with the dirty equipment. Simple metal brackets clamped to the top of the ladder give the workman extra "arms" when replacing dirty with clean parts.

When reflector cannot be taken down, the following procedure should be followed: (1) Use a cleaning agent that removes dirt quickly and thoroughly and requires no rinsing. (2) Wipe off excess moisture with clean cloth. Aluminum reflectors require special attention: (1) Avoid strong alkaline or acid cleaning agents. (2) Cleaning powders that are free rinsing are best. (3) Encrusted dirt can be removed by fine steel wool and liquid wax.

Cleaning of luminaires should be planned on the basis of an annual program. This method permits one trained crew to do all of the cleaning as they progress from one section of the plant to another. The annual schedule can be planned by considering the following points:

1. Take an inventory of all lighting equipment in the plant.
2. Determine time required to clean luminaires in each department. Time values in Table 2 may be used for estimating, but actual values for a particular installation may vary considerably.
3. Determine approximate frequency of cleaning necessary to maintain efficient lighting.
4. Work up practical annual schedule using the above data.

Unlighted sockets reduce illumination. If lamp outages are neglected, footcandle levels may drop 10% to 25% in a short time due to outages only. The following suggestions may be helpful in preventing excessive outages:

#### Preventing Outages

1. Patrol buildings each day and replace all outages. This system is economical in large installations where luminaires are readily accessible.
2. Instruct foremen to report outages as they occur.
3. Night watchman should report yard lighting outages.
4. Be sure to replace flashing fluorescent lamps as soon as possible. Continuous flashing will destroy the starter and may damage ballast. (Note that no-blink starters prevent this flashing of "burned-out" lamps.)
5. New lamps should be the same type, wattage and voltage as the removed burned out lamps.
6. Replace blackened or discolored lamps even though they may still be burning. Severe blackening usually indicates that lamp is nearing end-of-life.
7. Use a group replacement plan where luminaires are in hard to reach locations.

Light sources are designed to operate most economically when supplied with rated voltage. Voltage either too high or too low will affect the life, efficiency, and economy of the lamps as explained below:

#### Fluorescent Lamps

1. Standard ballasts are designed for 118, 208 or 236 volts. Published lamp data is based upon design voltage being applied to ballast and best operating results are obtained when line voltage is close to design voltage. Permissible variations from rated voltage allow the ranges of 110-125, 199-216 and 220-250 volts respectively.
2. Line voltage *higher* than the maximum limit of the range will shorten the life of the lamp and ballast.
3. Line voltage *below* the minimum limit will cause uncertain starting, short lamp life, and will reduce lighting efficiency.
4. Frequent starting will shorten lamp life.

#### Incandescent Lamps

1. Incandescent lamps are available in ratings of 115, 120 and 125 volts. Use lamp with rating *nearest to actual line voltage.*
2. Line voltage *higher* than rating will shorten lamp life, but will increase light output.
3. Line voltage *below* rating will extend life, but will reduce light output 3% for each 1% drop in voltage.

#### Mercury Lamps

1. Mercury lamp transformers (250 and 400 watt sizes) are available for 115 or 230 volts. They are supplied with line voltage taps of 100, 107, 115 and 123 volts and 200, 214, 230 and 246 volts respectively. *Be sure line is connected to tap which is closest to actual line voltage.*
2. Line voltage *higher* than connected tap rating may shorten life of transformer and lamp.
3. Line voltage *below* connected tap rating will reduce illumination and may cause uncertain starting.
4. Sudden serious drop in voltage may cause the lamps to go out and stay out for a few minutes until they cool and then restart.

### Table 2.—Time Values for Cleaning Typical Lighting Equipment

| Type of Luminaire | Means of Access To Luminaires | Approx. Manhours Per Unit* |
|---|---|---|
| **INDUSTRIAL** | | |
| 1. RLM Dome Reflector | Step Ladder | .12 |
| 2. RLM Dome Reflector | Overhead Crane | .26 |
| 3. High Bay Reflector | Overhead Crane | .35 |
| 4. Glassteel Diffuser | Step Ladder | .31 |
| 5. Two-Lamp Industrial Fluorescent Reflector | Step Ladder | .16 |
| **COMMERCIAL** | | |
| 6. Enclosing Globe | Step Ladder | .19 |
| 7. Indirect Bowl | Step Ladder | .24 |
| 8. Two-Lamp Enclosed Fluorescent | Step-Ladder | .48 |
| 9. Single-Lamp Enclosed Fluorescent | Step Ladder | .18 |

*These time values were taken from an actual time study made in an industrial plant, but should only be used for estimating as local conditions will determine time for individual cases.

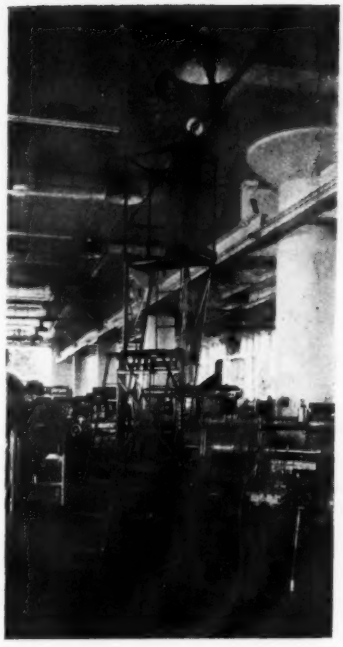


**Fig. 3. A small telescoping lift gives safe access to lighting equipment. Base of lift is only 32 inches by 55 inches.**

Light surroundings and equipment improve seeing conditions in five ways:

**How Light Paint Helps**

1. High reflection factor ceilings and walls increase actual footcandles because light is reflected to the working plane.

2. Light surroundings reduce the contrast between light sources and their background, thus minimizing glare.

3. Shadows are softened because light reflected from walls and columns diffuses the light.

4. The drab, "dungeon" effect of a dark room is eliminated.

5. Where indirect or semi-indirect lighting is used, a light ceiling is essential because the amount of light on the working plane depends upon the ceiling reflection factor.

In factory spaces, ceilings, columns and walls should be a durable mill white with a flat or eggshell surface. Machines should be finished a medium gray with a medium buff for areas immediately surrounding the point of work.

In offices and other commercial buildings, ceilings should be a durable eggshell white. Walls should be a light tint with reflection factor of 50%-60%. Any soft color such as cream, buff, green, or blue may be used to harmonize with the furnishings.

Dirt will accumulate on ceilings and walls in varying degrees depending upon the atmospheric conditions. Therefore, periodic cleaning and refinishing should be a part of the lighting maintenance program.

Mild cleaning powders containing little or no soap are best. Strong detergents such as tri-sodium phosphate should not be used as they will remove the finish.

For outside walls of buildings and fences, night visibility and safety in factory yards can be greatly improved by applying white paint on fences and building walls to a height of four or five feet above ground. This white finish will get dirty but will never be as dark as surfaces that are finished dark.

**Who Will Do This Maintenance Job?**

The most difficult maintenance problem in wartime is to secure the required personnel. In peacetime, workers are more easily obtained, but budgets are watched more closely. Therefore, at any time, maintenance work must be done with maximum efficiency of available manpower.

Today, most of the servicing of lighting is handled by the maintenance department of the plant, building or store. This can be done efficiently in relatively large buildings. One man should supervise lighting maintenance for the entire building. If left to department heads, maintenance will be practically non-existent because trained personnel will not be available to do the job. With individual responsibility, a crew can be well trained to handle lighting on the entire property on a planned schedule.

**Opportunity for Contractors**

In smaller factories and commercial buildings, the maintenance department may only consist of a janitor or handyman. This personnel is generally assigned to so many urgent duties that unseen dirt on luminaires will go untouched for many months.

Here is a real opportunity for an outside contractor to sell a service that could be inexpensive compared to the results obtained. This service could be offered by window cleaning companies, sign companies or special maintenance service organizations, but it is a "natural" for the electrical contractor who is already familiar with lighting systems.

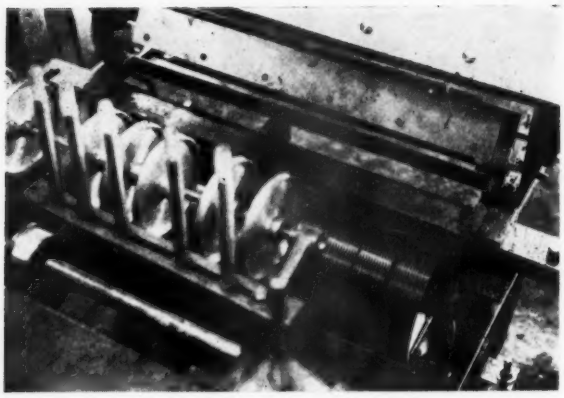
The contractor would agree to clean and inspect lighting at certain specified intervals for a flat rate plus nominal extra charges for repairs and renewal parts. Minimum cost would result because the complete service could be executed at one time and any defects would be corrected before they became serious.

**Fig. 4. In a dusty foundry totally enclosed dust-tight luminaires should be used to minimize maintenance.**

# Lighting for Magnification

By George J. Taylor*

***The highly specialized seeing problem and its solution described here will be of interest to textile plant operators because of similar conditions.***



**At the Wilbur B. Driver Company, Newark, New Jersey, the processing of chrome-nickel high resistance wire produced an exaggerated seeing problem. Under the new lighting system, production has increased considerably. The operators can see the wire more clearly than under the old system.**

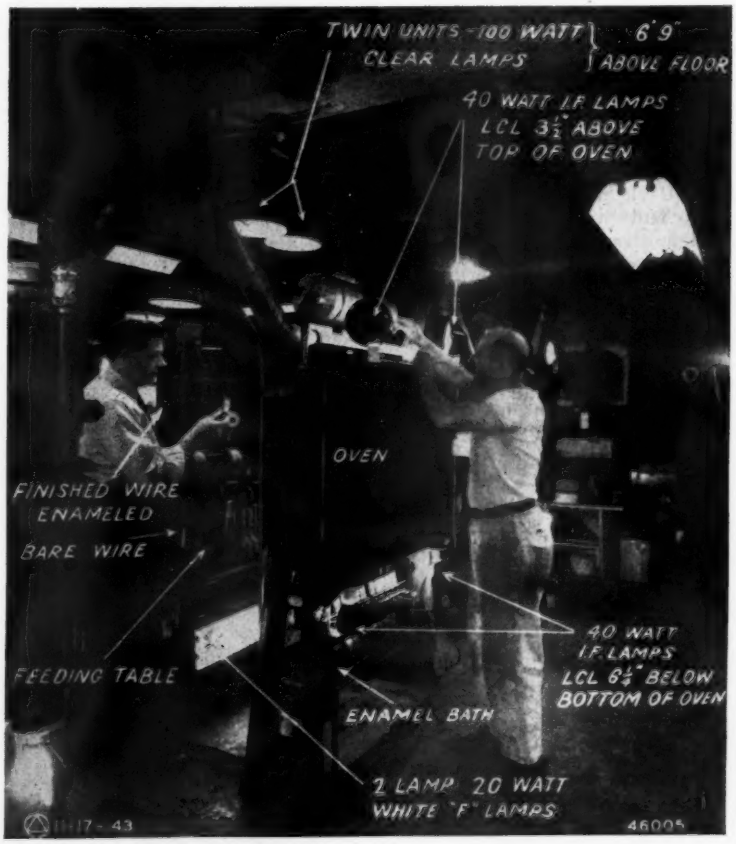
IN THE Enameling Department of the Wilbur B. Driver Company, in Newark, N. J., nickel chrome wire is insulated with baked-on enamel for use in electrical instruments and devices. Sizes vary from .0025 inch in diameter down to .0008 or roughly one-third the size of a human hair.

So long as war continues, demand for high resistance electrical wire will strain the capacity of all of the manufacturers who specialize in it. With need so great, speed is an essential in its production. Then, too, as everyone knows, careful supervision during every stage of its production is supremely important.

During any three complete shifts, any 24-hour production day, the Wilbur B. Driver Company, with their present machine capacity, enamel only three-tenths of a pound of .0008 wire. Even in the larger sizes, production is not as great as the demand. But 3 pounds of the heavier wire (.0025-inch) can be insulated in any 24 hours.

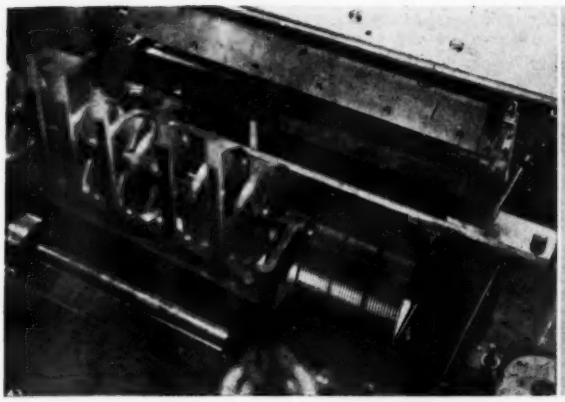
The machines on which this wire is processed have ten receiving spools which take the material directly from the enameling baths and the baking ovens. Similar wire may be processed as many as eleven times. The heavier the wire, the less processing is necessary; the largest sizes need go through bath and oven only once. All sizes of wire, however, must be kept rolling and, in motion, represent a very difficult seeing problem. The smaller the wire, the faster it moves, and the more complicated the problem.

At the Driver Company, twenty-four special machines run day and night. Each is tended by an expert operator. Careful adjustment

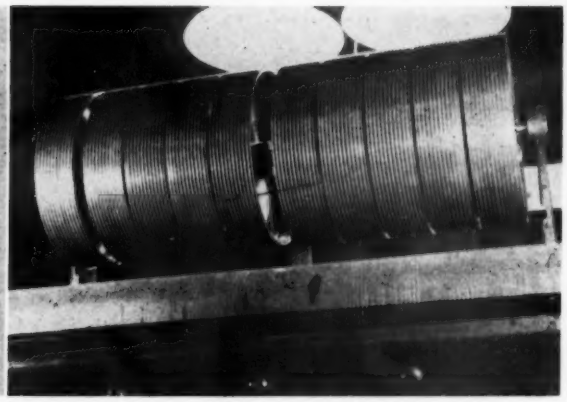

TWIN UNITS - 100 WATT CLEAR LAMPS
6'9" ABOVE FLOOR
40 WATT I.F. LAMPS LCL 3½" ABOVE TOP OF OVEN
OVEN
FINISHED WIRE ENAMELED
BARE WIRE
FEEDING TABLE
40 WATT I.F. LAMPS LCL 6½" BELOW BOTTOM OF OVEN
ENAMEL BATH
2 LAMP 20 WATT WHITE "F" LAMPS
11-17-43
46005

**A most difficult lighting problem was encountered on these wire processing machines where operators had to supervise the enameling of wires smaller than human hairs. On the next page is a detailed sketch of the lighting installation which increased efficiency and comfort.**

*Supervisory Engineer, General Electric Co., Nela Park, Cleveland, Ohio.

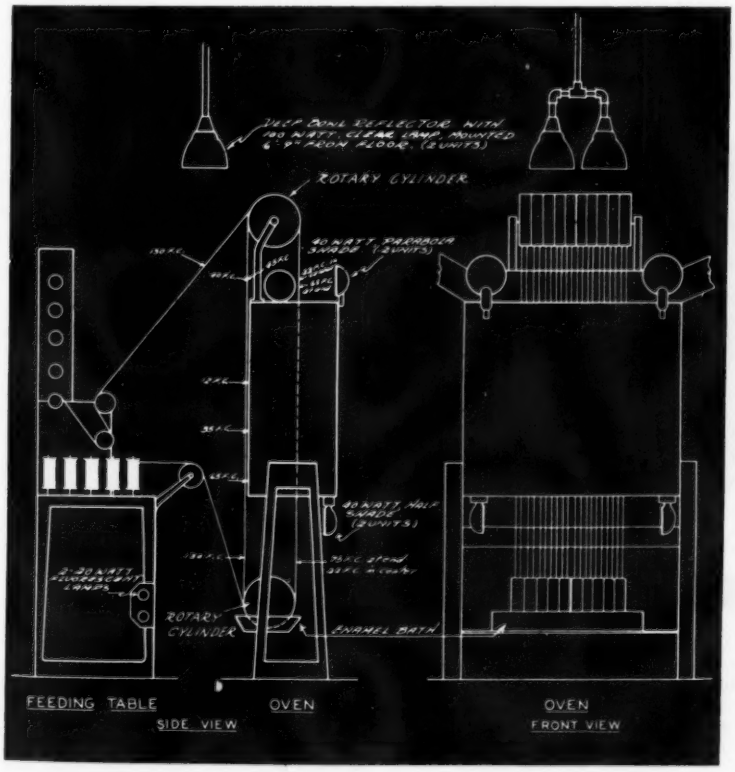


**At each of 24 machines, seeing is in two planes. The operator must stand to control the flow of wire at the top of the machine, squat to adjust it at feeding table levels. Localized lighting solved the problem.**



**Balance between the light sources used is so delicate that to turn off any pair of localized lighting units can cause the wires to disappear. Co-ordinated lighting provides good seeing conditions and a satisfactory lighting job.**

of wire must be maintained at the top of each machine as well as the bottom. Wire in process, between the rotary cylinder sheves and the winding spools, must be properly positioned by the operator. It is imperative, while operators are in a standing position, that they be able to see the wire at the lower part of the machine so that they can follow it in making adjustments as they approach a squatting position. Squatting or standing, they must be sure of the continuous adjustment of rapidly moving, hard-to-see wire. So that they may see, operators need light in a lot of different places on each machine. Lighting units need to be shaded or shielded because glare in the eyes of oprators can make the fine wire completely invisible.




**Side view and front view of the fine wire enameling equipment showing the specially designed lighting, which enables the operators to follow the movement of wires as small as .0008 inch.**

The new lighting installation pictured on these pages is both unusual and efficient. It combines two primary light sources: fluorescent and incandescent. It employs five types of functional fixtures. Two types are ceiling suspended. The 2-lamp, 40-watt fluorescent industrial fixture is used around the machines for good general illumination. These are used to preclude the possibility of harsh contrast due to the abundance of localized lighting

*(Continued on page 94)*

# Field Test Provides Proof of Lighting Maintenance Value

By E. B. Richey*

PROBABLY the least glamorous subject in the lighting industry, and the most difficult to sell the user, is the necessity for reasonable maintenance — so essential to satisfactory lighting results. For without reasonable maintenance, the progress made by lamp research, fixture design, and correct application go for naught.

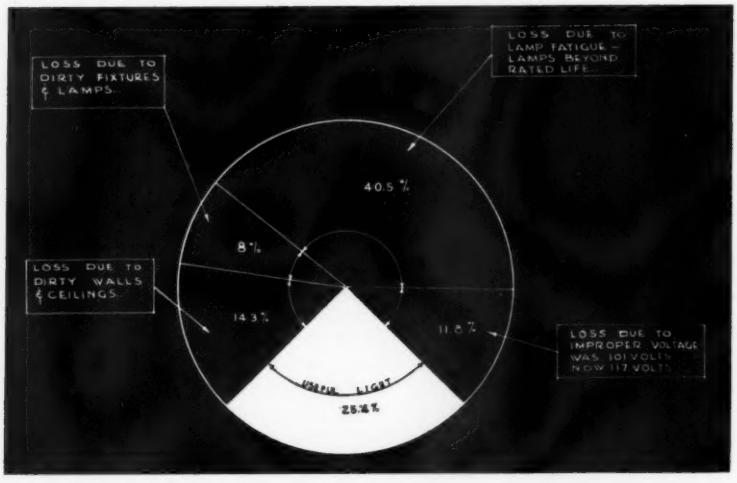
Correct lighting design includes a maintenance factor which will give the average lighting results to be expected over a period of time. This allowance may be referred to as the safety factor and is the ratio between average maintained illumination in service and the initial illumination. Because conditions vary under which lighting systems must operate, it is the responsibility of the lighting engineer to select the proper factor which must be applied to each installation.

The need for maintenance can best be sold at the time the installation is being designed, and failure to do so at that time may offer one clue for the dissatisfaction which often develops later when the user is awakened to the fact that he is getting but a small fraction of the designed illumination.

The acceptance and widespread use of fluorescent equipment in recent years has placed more importance than ever on maintenance. There are several reasons for this. First, the user has a greater investment to protect in his equipment, which is more costly than filament fixtures. Second, there is more to maintenance than cleaning the fixtures. Starters, ballasts and lamps must be kept in proper operating condition so that all lamps burn properly in a multi-lamp fixture. Third, because lamps do not fail in the same manner as filament lamps, many are left in service long after their usefulness as efficient light sources have past.

Every business man wants, and has reason to expect, full value for each dollar spent for light. It becomes quite a shock to discover only fifty cents, or even twenty-five cents, is being received for the lighting dollar. A convincing way to bring out the economic necessity for following a systematic maintenance schedule is to make a study similar to the one shown in the accompanying diagram.

*Illuminating Engineer, Birmingham Electric Company, Birmingham, Alabama.


LOSS DUE TO DIRTY FIXTURES & LAMPS
LOSS DUE TO LAMP FATIGUE — LAMPS BEYOND RATED LIFE
40.5 %
8%
LOSS DUE TO DIRTY WALLS & CEILINGS
14.3%
11.8%
LOSS DUE TO IMPROPER VOLTAGE WAS 101 VOLTS NOW 117 VOLTS
USEFUL LIGHT
25.4%

**The loss of light that results from neglect of maintenance is illustrated dramatically in this chart. It is the result of an actual field test on a fluorescent installation in Birmingham which had not been getting proper maintenance. Four remedies were applied: (1) voltage was brought back to normal, (2) lamps beyond rated life were replaced, (3) fixtures and lamps were cleaned, and (4) walls and ceilings were cleaned. As each operation was performed, the illumination intensity was measured to determine the amount of light restored. The results are shown here and indicate that the owner of this installation was getting only 25.4% of the illumination for which his system was designed and capable of providing if properly maintained.**

### How Test Was Made

An area was selected where maintenance had obviously been neglected. Footcandle readings averaged only 10 for a designed result of 40 footcandles. Observation revealed the walls and ceilings had depreciated in reflection factor; the equipment needed cleaning; the lamps were considerably past their usefulness; and improper voltage was discovered at the fixture. To bring out the improvement that each operation made in correcting the difficulty, readings were taken after each step. Washing the walls and ceiling restored 14.3% of the light loss. Cleaning the fixtures restored another 8%. Relamping resulted in regaining 40.5%, and correcting the voltage added 11.8%. The final illumination was in excess of 50 footcandles. Reasonable maintenance will provide the 40 footcandle design value.

All problems are not quite this bad, but it is a serious obstacle to good lighting when only twenty-five cents of the lighting dollar is being realized. There is much yet to be done along this line as we work towards greater lighting progress.

## Largest Lamp 50,000 Watts, It's Bigger Than a Basketball

The largest incandescent lamp is a 50,000-watt bulb, bigger than a basketball. It is used occasionally for special flood lighting purposes, costs $500 and consumes enough current to light 600 homes. The smallest is the size of a grain of wheat and was developed first for surgical use. Now at war, it signals the bombardier when a death-dealing "egg" is released.

**The light meter was the spearhead of the Better Light — Better Sight crusade. New developments indicate that it will have an important place in postwar lighting programs.**

# Light Meter Development Keeps Pace With Industry

By R. T. Pierce*

THE PART the photoelectric light meter played in the successful Better Light-Better Sight crusade of a decade ago is now a matter of lighting history. Its use enabled lighting practitioners of that period to set-up lighting standards in terms of footcandles, and to educate the public to the advantages of better lighting in terms of seeing levels of illumination.

The part the light meter is now playing in the war effort deserves its recognition as a meritorious contribution to the betterment of industrial lighting conditions for a victorious America. That the postwar relighting period will see its continued use as the standard instrument for light measurement is a certainty.

With the removal of wartime restrictions and release of material now subject to priorities, the rush to rehabilitate the nation's depleted stocks and war-neglected lighting facilities will begin.

It is only natural that the knowledge gained from the enforced study of lighting and its effect on production will greatly influence postwar planning of lighting installations and replenishment.

It is these factors that encourage the prediction by leading illumination engineers, whose business it is to plot the graphs of America's lighting market, that a tremendous upswing in the demand curve will immediately follow the war's end.

To take full advantage of the approaching golden opportunity, a highly comprehensive program is already being formulated — a program that will require the training of a peacetime army of lighting specialists predicted at two to three times larger than heretofore employed.

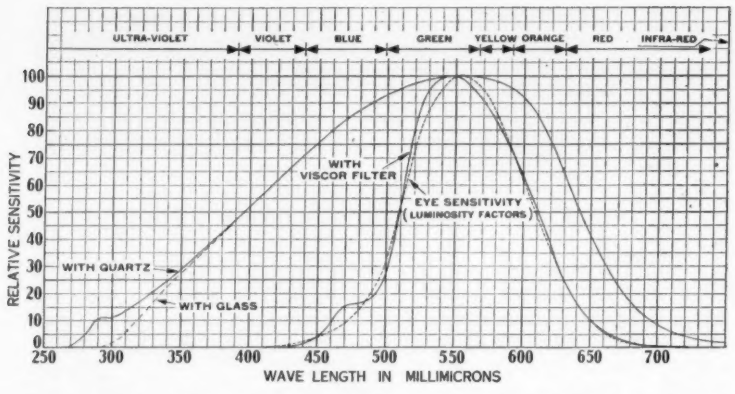
It is therefore essential that recruits in the new army be thoroughly trained in light meter technique. Certainly every training curriculum will include this all important chapter.

In the meantime, it is equally essential that those who will do the teaching keep informed of new refinements in construction, and improved operating features of light meters in general, and how these changes will aid the authoritative analysis of lighting conditions, and how they will meet the many new problems that will confront the postwar lighting specialist.

The increased use of gas tube lighting is a certainty. Fluorescents have already made deep inroads in industrial lighting, and the new cold-cathode low-voltage fluorescents will find expanding markets in stores, offices and homes.

Neon lighting is in the picture. The successful coiling or spiraling of tube lamps provides won-

*Weston Electrical Instrument Corporation, Newark, New Jersey.




**This spectral sensitivity graph illustrates how the application of the Weston Viscor filter to their Type 3 Photronic cell filters out the unwanted energy of radiant flux outside the limits of seeing, moves the sensitivity peak back to the eye sensitivity peak of 555 millimicrons, and so closely duplicates the entire eye sensitivity range that the filter "correction" can be considered almost perfect.**

derful possibilities for creative designing of gas tube fixtures, floor and table lamps for home usage. The use of curved tubes in combination with incandescent lamps is now a reality.

All of which, from the standpoint of light measurement, means *mixed* light will predominate, and the correct reading of this conglomeration of wave lengths requires a light meter that automatically and instantaneously translates this color texture into a meter reading which is in terms of just what the eye sees.

Of the many methods of measuring light that have appeared since the antiquated grease-spot comparison method, the Photronic cell represents the latest and most satisfactory means of obtaining accurate, direct readings.

The ability of selenium to convert light energy directly into electrical energy to a degree sufficient to operate direct current instruments, and even relays, without amplification, is directly responsible for the photoelectric cell-microammeter combination being adopted as the present-day standard instrument for light measurement.

Entirely electronic in action, the Photronic cell is a self-generating solid, or so-called "barrier layer" type of photoelectric cell, differing from other types in that the semi-conducting medium between its electrodes consists of a dry solid; in phototubes this medium is a partial vacuum or gas, and in photovoltaic cells it is a liquid.

In operation, light, defined as radiant energy within the wave length limits of sight, striking the upper semi-transparent negative electrode of the cell "sandwich," is converted into electrical energy directly proportional to the amount of light gathered. When the cell is connected to a specially designed low-resistant microammeter, with a scale calibrated in footcandles, the resultant reading is "direct."

Light, as seen by the human eye, roughly spans the visible spectrum between 400 and 700 millimicrons. Due to the inherent characteristics of selenium, the Photronic cell responds to this range of wave bands, and to a certain degree to adjoining wave lengths beyond the sight limit.

The accompanying chart shows the relative sensitivity of the Photronic cell (Weston Type 3) as a function of wave length, in millimicrons.

However, that portion of light to which the human eye responds is far narrower in wave length range than the photoelectric cell range. The human eye sees color, normally, from a light violet through blue, green, yellow, or-

(*Continued on page 42*)

**The Viscor equipped Photronic cell on this Weston Model 614 footcandle meter is hinged to allow tilting to facilitate measurements when the instrument is lying flat. A range changing switch allows selection of anyone of three footcandle ranges.**

**To facilitate readings in inaccessible places this Weston Model 603 footcandle meter is provided with a removable target. Housing two Photronic cells, it is connected to the instrument by a 6-foot length of flexible cable. This model is recognized as a precision instrument for lighting surveys and measurements requiring a high degree of accuracy over a broad range of light values.**

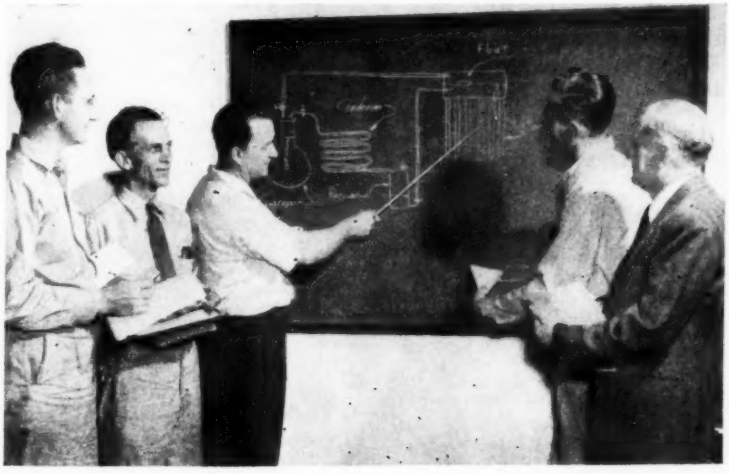
**Understandable to the average person, this compact, direct reading instrument is the accepted standard for measuring illumination in terms of seeing. Equipped with a Viscor filter, this Weston Model 703 Sight Meter is an invaluable aid for the promotion of better sight through use of better light.**

# Appliance Service Schools Produce Trained Mechanics

By Baron Creager

AS A RESULT of a number of schools held throughout Texas, upwards of a hundred mechanics—experienced and inexperienced—are now better qualified to make the more complicated repairs on small appliances and refrigerators or have eased the strain on domestic life by learning to make the simpler repairs in their own homes.

The most thorough of these schools, perhaps, are those inspired by the Manpower and Training Program for the Refrigeration Industry.



Such schools involve no cost to the trainee, experienced or inexperienced. They are paid for with Government funds, are sponsored by state departments of vocational training, and involve fairly complete instruction in domestic and commercial refrigeration.

Any community can obtain such a school by following the procedure outlined by the National Refrigeration Service Manpower Committee and the principal step to this end is organization of a local emergency refrigeration service council, in which some utility generally takes the lead.

Half a hundred qualified refrigeration mechanics have graduated from two such schools in Texas, organized under the direction of J. H. Apperson as temporary co-ordinator. Mr. Apperson is in charge of residential and commercial service for the Texas Power and Light Co., Dallas.

The Tyler, Texas, school which recently graduated 27 men, is an example of the way this program works out.

Since Tyler had been designated as a manpower shortage point and since Apperson had been named temporary co-ordinator, his principal function was to contact refrigeration service agencies, arouse their interest in the school and get men enrolled.

Of those enrolled in the Tyler School, a substantial number were beginners and some were maintenance men for local institutions who wished to qualify themselves to maintain their employers' refrigeration equipment.

Employers in Tyler, according to Apperson, are highly complimentary of the results obtained under Leon Maddox, of the Maddox Air Conditioning Co., of Tyler, who served as instructor.

The concensus is that the school raised the efficiency and knowledge of experienced men to the point that they are able to do better work in less time and prepared beginners to do the simpler jobs of refrigeration repair.

Classes were held for three hours each of three nights a week and the course ran for 13 weeks. For the 11 hours of study involved, the course was divided into three main

•

**Typical scenes in appliance service schools held in Texas. At left is a group gathered around blackboard at Tyler, Texas, school, which was taught by Leon Maddox, of Maddox Air Conditioning Co. Below, a similar class at Decatur, Texas.**

sections — General Principles, Operation and Maintenance of the Domestic Refrigerator, and Operation and Maintenance of the Commercial Refrigerator. To convey an idea of the extent of instruction, there are 67 specific subdivisions of the course, with most of the study hours devoted to the domestic box. In this category the student gets instruction in compressors, refrigerant controls, motor controls, servicing domestic units and the absorption refrigerating system. The text used, Modern Electric and Gas Refrigeration, is available to trainees at cost when they finish the school.

More schools would now be in progress in Texas if instructors were more readily available. However, qualified men, who get paid for their instruction service, are difficult to find and Apperson suggests that any community planning to institute a similar school should first determine whether or not the right man is available as instructor.

But the acute need of continuing the program and increasing the number of qualified refrigeration service men is emphasized by W. Ray Kromer, national manpower and training director for the refrigeration industry, in this statement:

"As the war progresses, many people feel that in a very short time normal times will return, and further activity in solving the present problems may be unnecessary. In our opinion, *this is wishful and dangerous thinking.*

"Materials may be released under one order, but restricted under another. When materials *are* released, plants will not be ready to resume manufacturing. The majority of servicemen will probably be retained six months or longer after the conclusion of the war in the Pacific. Food required for the Army of Occupation and occupied countries will be tremendous. Our manpower problem in the refrigeration industry has really not attained full growth. This training is needed badly now by the refrigeration industry and by the war effort to keep equipment operating.

"It is recommended that all service agencies increase their organizations by at least the number of men that they actually needed last season. Break-downs will be even more numerous next season, and conditions will be no better from the standpoint of long hours and deferred service calls.

"After the war is over, thousands of refrigeration installation men will be needed to replace the worn-out equipment. It is recommended that as many trainees as possible be placed on the job so that the men who have carried on in spite of all handicaps will be in a position to take care of the postwar business that will be available and should rightfully be theirs.

"Remaining service agencies can increase their organizations and thereby eliminate the possibility of incompetent free-lancers being given the opportunity of coming back into the industry to skim the cream on new equipment sales with resulting thousands of undersized and badly engineered installations.

"We, therefore, have a two-fold incentive and obligation in doing our utmost to make this program a success in all communities throughout the nation."

Other schools in Texas have been sponsored and financed by utilities, with emphasis divided between refrigeration and small appliances.

The Dallas Power and Light Co., with Ray Dixon as permanent co-ordinator, organized and conducted a refrigeration repair school in Dallas. Trainees were obtained from service agencies, which paid inexperienced men a nominal wage during the training period, then put them on the payroll as permanent employees when they satisfactorily finished the course.

Sixteen schools on the repair of small appliances have been conducted throughout its territory this year by the Texas Power and Light Co. The utility supplies the instructor and he moves from point to point in the territory, organizing, conducting and completing a school before he changes location.

## State Directors of Vocational Training for War Workers

| | |
|---|---|
| Alabama | Dr. J. B. Hobdy, State Department of Education, Montgomery 4. |
| Arkansas | Fred A. Smith, Room 120, State Capitol, Little Rock. |
| Delaware | R. W. Heim, Administration Bldg., 11th and Washington Sts. |
| Dist. of Columbia | Lawson J. Cantrell, District Director of Vocational Training for War Production Workers, Franklin Administration Building, 13th and K Sts., Washington 5. |
| Florida | R. D. Dolley, State Department of Education, Tallahassee. |
| Georgia | M. D. Mobley, State Department of Education, Atlanta 3. |
| Kentucky | Dr. Ralph H. Woods, State Department of Education, Frankfort. |
| Louisiana | Dr. Andrew Triche, State Department of Education, Baton Rouge. |
| Maryland | Glen D. Brown, 1111 Lexington Bldg., Baltimore 1. |
| Mississippi | H. E. Mauldin, Jr., State Department of Education, P. O. Box 711, Jackson 106. |
| North Carolina | J. Warren Smith, State Department of Public Instruction, Raleigh. |
| Oklahoma | J. B. Perky, A. & M. College, Stillwater. |
| South Carolina | B. R. Turner, State Department of Education, Columbia 10. |
| Tennessee | C. E. Freeman, State Department of Education, Nashville 3. |
| Texas | James R. D. Eddy, State Department of Education, Austin 11. |
| Virginia | Dr. B. H. Van Oot, State Department of Education, Richmond 16. |
| West Virginia | William B. Connoley, 1721 Quarrier St., Charleston 1. |

**Any one interested in organizing refrigeration service schools similar to the schools described in the accompanying article can obtain further information by writing to the individuals listed above. The title State Director of Vocational Training for War Production Workers should be used unless a different title is indicated above.**

# FOR DEPENDABLE LIGHTING SERVICE

**DURO TEST 2,000 HOUR INCANDESCENT LAMPS** are sturdily designed and ruggedly constructed to withstand the severe operating conditions encountered in industrial lighting, and to give much longer service than is to be obtained from ordinary "general service" lamps. They are fully backed by the Duro Test one year free replacement guarantee.

DURO TEST FLUORESCENT LAMPS, too, are distinguished products of precision engineering and high manufacturing standards. They are warranted for an entire year—your assurance of long, dependable service.

**BY CALLING REGULARLY,** our trained representatives become acquainted with your lighting layouts and lamp requirements. They recommend the proper lamp for the proper service and offer, without obligation to you, the services of our engineering department for the solution of technical lighting problems.

There is a representative in your area ready to offer you dependable Duro Test Lighting Service. He will show you how to reduce expensive maintenance, cut work stoppage and improve your safety factor with Duro Test, America's Industrial Lamp.

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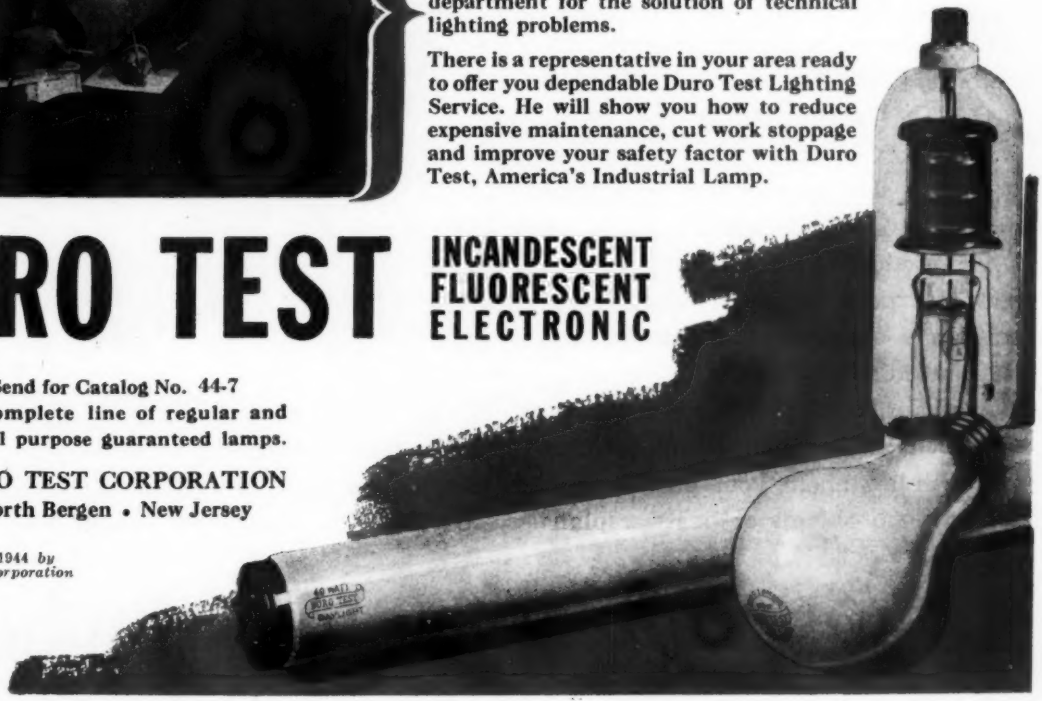

Send for Catalog No. 44-7
for complete line of regular and special purpose guaranteed lamps.

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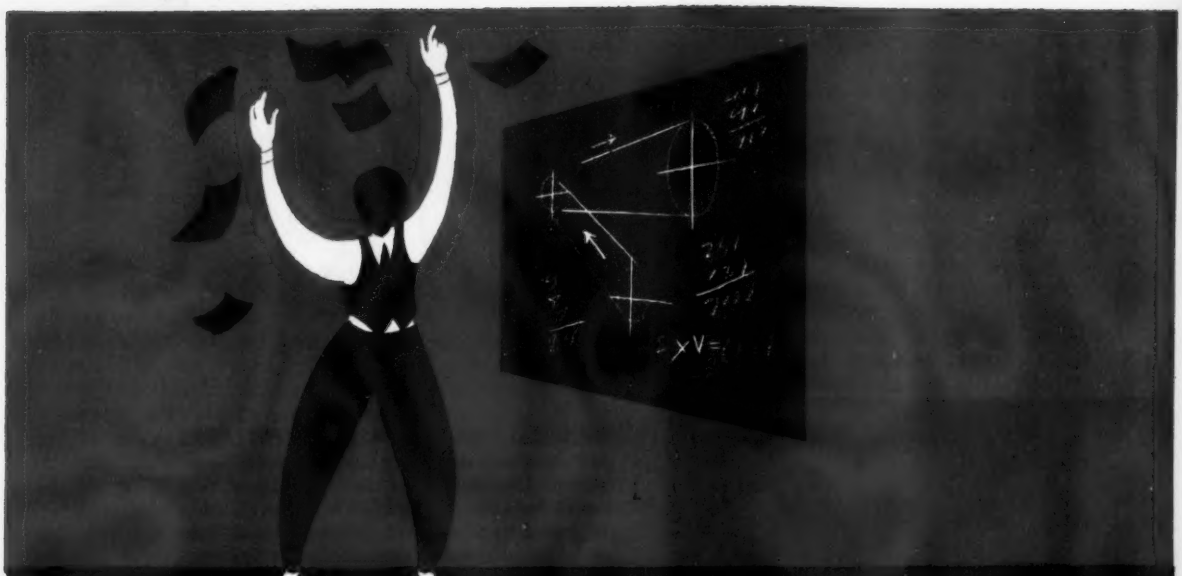


# SOLVE YOUR SPEED REDUCTION PROBLEMS

## with Westinghouse Gearmotors

80% of all motor-driven machines, 1 hp and above, must operate at slower speeds than the motors which drive them.

Consequently, some type of speed reduction must be inserted between the motor and the driven machine. The best method of accomplishing this is by the use of Westinghouse Gearmotors which are slow-speed drives with high-speed motor efficiencies.

The product of more than 50 years of gearing experience, these Westinghouse units are designed, built, tested and guaranteed as single units.

Ask your Westinghouse representative about this new, efficient gearmotor. Consult with him about your present speed reduction problems or postwar plans.

Type C — A double-reduction unit for standard ratios from 7.6:1 to 25.7:1, inclusive.

Write for new gearmotor handbook, "Gearmotor Applications". Ask for B-3218. Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., Dept. 7-N.

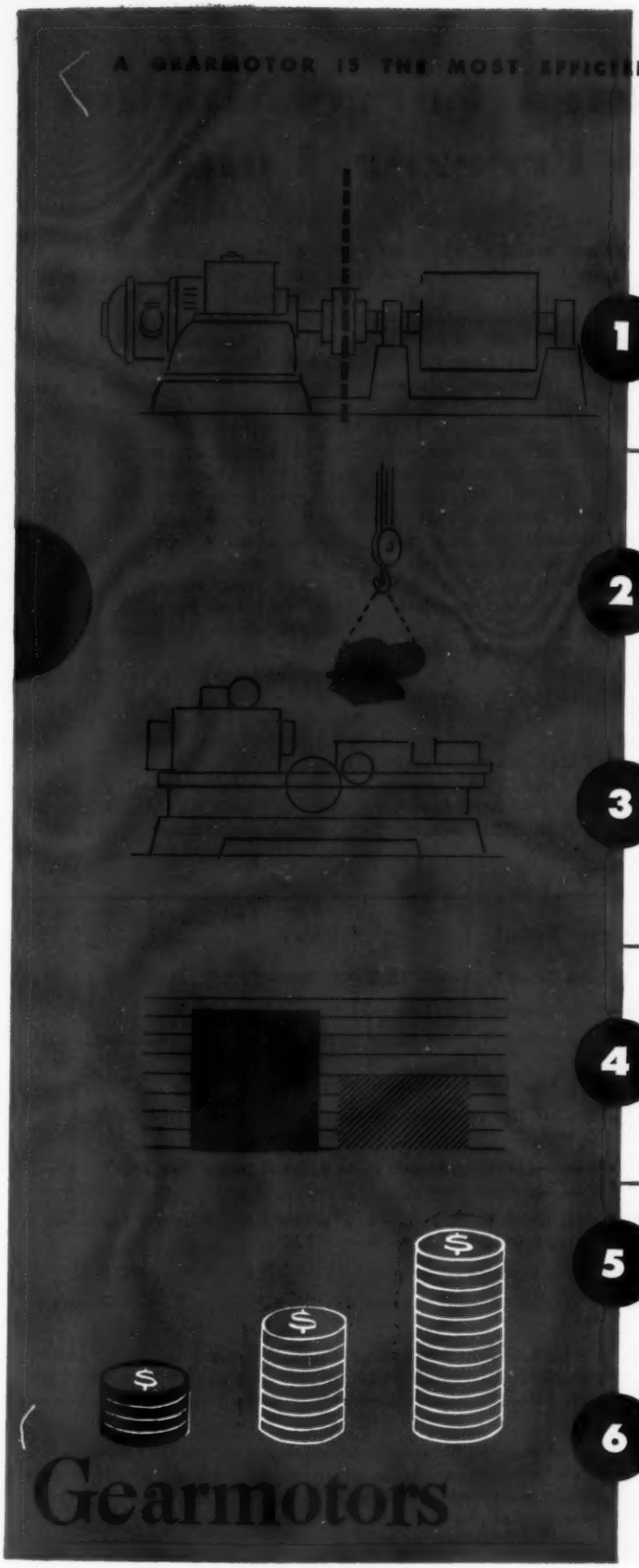
J-07217

First of a series sponsored by Westinghouse to promote the use of gearmotors.

*The New* Westinghouse

PLANTS IN 25 CITIES... OFFICES EVERYWHERE

A GEARMOTOR IS THE MOST EFFICIENT MEANS OF SPEED REDUCTION




## *Because it offers:*

1 **COMPACTNESS . . .** it takes less space than any other form of parallel shaft speed reduction . . . makes belts, belt guards, pulleys, overhead line shafts *unnecessary*.

2 **LONG LIFE—MINIMUM MAINTENANCE.** A gearmotor has no belts, chains or ropes to replace . . . no multiple-parts to realign . . . no bearings to oil . . . no gears to grease. Probable maintenance consists of a twice-a-year oil change.

3 **EASE OF INSTALLATION.** By combining the prime mover and speed reducer in a single unit, the gearmotor is installed quickly and inexpensively.

4 **HIGH EFFICIENCY.** Only 2% power loss is involved in each stage of reduction . . . a single-reduction unit is 98% efficient; a double-reduction unit is 96% efficient. Compare this with the efficiency of other types of slow-speed drives.

5 **LOW OVER-ALL COST.** The initial installed cost of a gearmotor is usually lower than any other type of speed reduction. On the basis of maintenance and power losses, a gearmotor is *always* most economical.

6 **SAFETY FOR WORKERS.** A gearmotor has no exposed moving parts... no belts, pulleys, chains or ropes to endanger workers. It is totally-enclosed in a streamlined housing.

# Survey Indicates Large Market For Home Freezer Units

THE DISCLOSURE that an indicated 4,000 frozen food locker operators — reflecting the thinking of 1,500,000 families now renting storage space in their plants — will retail home freezers in postwar, confirms the prediction, often labeled over-optimistic, that 1,000,000 of this new home appliance will be sold during the first two years after the war, according to F. F. Duggan, of Edison General Electric Appliance Company, Chicago, Illinois.

A questionaire sent to all of the 5,000 locker plants across the country brought answers to ten questions from 1187 operators (24 per cent), which stamp them collectively, as alert, progressive, and aware of new trends in the food processing industry. It also reflects the effects of Army and Navy emphasis on correct food processing and packaging, as well as the results of numerous wartime appeals to avoid waste and improve the national diet, the Hotpoint sales head, who manages the refrigeration sales division, said, adding:

"Ordinarily, our appliance dealers, which include department, furniture, and hardware stores, as well as specialty appliance retailers, would not consider that the addition of 4,000 new competitors would be a good thing. But I think they will all agree with me that when they can enter a ready-made market for any new appliance — that is obviously a good thing; and they, with their years of merchandising experience will be able to hold their own against any merchandising competition in a field where there is a ready-made demand for the merchandise."

Elaborating on other results of the survey, Mr. Duggan noted that before the war, 51.6 per cent of the locker plants sold food at retail; in postwar, 78.3 per cent plan to enter this field, with 18 per cent planning to set up truck service routes. Upon this he commented:

"This offers conclusive evidence to food dealers that there will be huge and highly competitive market sources for frozen products. Much of the present uncertainty and confusion concerning the future of frozen foods is due to bad conditions prevailing at the retail level before the war in the distribution of national brand foods. This was caused by poor display; and worse, almost no home facilities for storing frozen foods when several packages were bought at once. To aggravate this from the retail food dealers' viewpoint, widespread publicity indicated that he had a new line upon which he was making lots of money.

"Food retailers, as do other merchandisers, know that a small, poorly displayed line of merchan-

## Tabulated Frozen Food Locker Survey

1. **Do you now process and package frozen food? Yes—78.3%; No—21.7%.**
2. **Do you now sell frozen food to retail consumers? Yes—51.6%; No—48.4%.**
3. **Do you plan to sell, process, package and retail frozen food after the war? Yes—80.8%; Uncertain—6.1%; No—13.1%.**
   **(Yes answers classified: Meats—81.5%; Vegetables—90.7%; Fruits—91.6%.)**
4. **Do you intend to expand your operation for the retailing of frozen food after the war? Yes—73.8%; Uncertain—11.8%; No—14.4%.**
5. **Do you plan to sell and distribute commercial brands of frozen food after the war? Yes 76.9%; Uncertain—8.0%; No—15.1%.**
6. **Do you plan to distribute packaged frozen food by truck, on a scheduled delivery basis, to homes after the war? Yes—18.1%; Uncertain—18.1%; No—63.8%.**
7. **Did you sell frozen food home storage cabinets before the war? Yes—7.1%; No—92.9%.**
8. **Do you intend to sell frozen food home storage cabinets after the war? Yes—79.0%; Uncertain—13.2%; No—7.8%.**
9. **Have you any suggestions for features which would be desirable in a frozen food home storage cabinet? Four hundred suggestions came in response to this question. 83 suggested a combination home freezer and domestic household refrigerator. 26 other suggestions were submitted.**
10. **Would you care to make any comments about the frozen food business in the postwar period? A total of 554 comments were received. An analysis of these as well as answers to question 9 are included in a reprint available from the Market Research Division, Edison General Electric Appliance Co., 5600 West Taylor Street, Chicago 44, Illinois.**

# WHEN THE LIGHTS GO ON AGAIN!

You will find NOMA ready for you with all the clever, new, sales-creating ideas that you have learned to expect from "headquarters for decorative lighting specialties, equipped with Mazda lamps."

## MEANTIME

**NOMA CONTINUES TO MAKE THESE WARTIME PRODUCTS:**

- Flight Recorders
- Searchlight Parts
- Telescope Parts
- Marine Type Electric Heating Equipment
- Aircraft Parts
- Instrument Parts
- Electric Wire and Cable
- Mica Capacitors

## INCREASE VOLUME AND PROFITS BY PUSHING THESE NOMA SWIFT SELLERS

NOMA'S way of helping out is to make available these "extra civilian" items — all packaged ready for quick turnover.

**SENSATIONAL WALKING DOG!** Pull on leash — and HE WALKS on 4 legs. Composition. 11" long, 7½" high. Individually packed — decorated display box.

**OTHER ATTRACTIVE ITEMS:**

No. 780 Caterpillar tank. Looks like an M-5.
No. 752 Victory oil truck. No. 751-S Dump truck.
Fairyland character dolls.

**NOMA WOODIES** 6-car de luxe train set. No. 754. All wood. 54" long, 3" wide, finished in contrasting bright colors. Packed individually in beautiful display box.

# NOMA ELECTRIC CORPORATION

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dise never sells well, and this is especially true where there is no big industry-wide advertising promotion."

Mr. Duggan made the point that a high percentage of locker operators would expand their food handling operations to include retailing foods, and selling home freezers, because the locker plant is a basic service in each community, this assured other retailers offering frozen foods or home freezers an established local food freezing service.

"There must be facilities in every community for the processing and packaging of home grown foods; these facilities must be available to homes, as well as to local commercial packers," he said. "The packaging industry has made great strides in providing a product that will preserve foods in storage, the commercial lines of branded frozen foods will expand to offer greater selections and number of products; so we see all of the opportunities of the original refrigeration market of twenty years ago, coming again; including the development of a new food merchandising industry. Unlike twenty years ago, appliance dealers will have merchandising experience which should help them avoid some of the mistakes of the past."

#### Opportunity for Dealers Great

According to Mr. Duggan, there were approximately 27,000 retail outlets for electric appliances before the war. He said that there are nearly 31 million wired homes in the nation. These figures place emphasis on the fact that the market is broad, and the opportunity for sales almost limitless — "the opportunity of any single appliance dealer being largely determined by his own merchandising ability."

"The demand for home freezers depends on the availability of frozen food supplies: we know of one meat packer who plans to spend several million dollars promoting meat products; a dairy concern which will operate to food retailers on a consignment basis; of another general food processor who will introduce a national line of frozen foods as soon as he can procure facilities — this list could be enlarged indefinitely. Now it looks like that leaves it up to the electric refrigeration industry, including its established experienced appliance retailers, to supply the cabinets to homes that will permit them to take advantage of volume purchasing, convenient stored supplies of foods, and the economy of preserving home grown products.

Mr. Duggan pointed out that home frezers will be a companion piece in the lines of most refrigerator manufacturers, not affecting the sales of standard refrigerators, nor models which supply a compartment for frozen food storage. This latter model was only slightly better established than the home freezer when war curtailments halted its production, he said. It is thought that the standard model will be the immediate postwar favorite, as it always has been: with the freezer compartment models gradually finding favor in city markets, particularly.

Mr. Duggan said that there was no feature in a home freezer that permitted it to take the place of the standard domestic refrigerator, and since the unfilled demand for this latter type amounted to an estimated 3½ million units when war intervened, dealers would enjoy a healthy business on these models when they are again available. Home freezer sales may start slowly, but will accelerate when frozen food supplies become plentiful. Mr. Duggan said that another Hotpoint survey recently announced, showed that the domestic refrigerator is still the star appliance in the thinking of 96 per cent of all appliance dealers.

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## Regulations Affecting Radio Servicemen

AS THE RESULT of a number of inquiries received by the Radio and Radar Division of the War Production Board, the Domestic and Foreign Branch has compiled information for the guidance of radio repairmen now in business and ex-repairmen and men discharged from military service in order that they may know how to obtain necessary materials to carry on or enter into the radio repair business.

Radio specialists of the Field Service Branch of the Radio and Radar Division in regional and district offices of WPB will be able to assist these persons through their knowledge of WPB orders and of the problems of the civilian radio industry in wartime, the Domestic and Foreign Branch said. There are no magic methods for the procurement of repair parts, tubes, test equipment, etc. for civilian use, and it is the individual responsibility of the radio repairman to (1) use the minimum of equipment and material (2) use substitutes wherever possible, and (3) locate sources of supplies available for repair purposes.

Under the terms of Central Limitation Order L-265 a radio repairman may create an initial inventory of component parts by special authorization from WPB Radio and Radar Division. A letter of application must be submitted for the authorization and should incorporate the following information:

(a) minimum quantity of components required;

(b) area to be serviced;

(c) home or store operation;

(d) business record of applicant;

(e) discharge number (in case of men discharged from military service);

(f) any other related information.

If feasible, the letter of application should come through the Field Service so that a specialist in the field may make any necessary investigations and forward the application, with recommendations, to the Radio and Radar Division in Washington. At times personal contact with the applicant should prove helpful for the purpose of discussing all phases of the enterprise.

In general, persons wishing to go into the service business and writing to the WPB will be asked to contact the Radio and Repair Specialists in the local Field Office. A special authorization can be issued by the Radio and Radar Division which will permit an applicant to obtain an initial inventory. This authorization will permit the purchase of a starting inventory. However, it does not procure the material; *the applicant must find the source of supply.* Under the terms of Limitation Order L-265 no preference rating is needed and preference ratings are not being assigned for this purpose.

Also under the terms of Order L-265, components and tube replacements may be purchased by the repairmen when the radio set requiring replacements is in his shop. After using a part to make a repair, a serviceman may use the

(*Continued on page 89*)

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# Simplifying System Layouts

By A. C. Monteith*

## Part 2

**In a previous article, the author described the advances that had been made in apparatus and systems. In this article, he points the way to system simplification and tells where to concentrate efforts to obtain maximum results in reduced costs.**

•

THE EXAMPLES described in the first part of this article (See August issue) suffice to show that in the last 20 years the reliability of equipment has materially improved so that it should be possible to modify our thinking in connection with the equipment that it put into systems and still maintain a high degree of reliability. Also, the pyramiding of probabilities should be eliminated where possible to minimize the amount of equipment necessary to secure a given reliability of operation. If too much equipment is installed in an attempt to secure an abnormal degree of reliability, it is quite possible, actually, to increase instead of decrease the probability of outage. Considering all factors, we should do everything possible in the planning of a system to use a minimum of equipment.

If we accept the above statements the natural question is, "where can we get the greatest return for a given amount of effort?" In considering this point, let us break the power system into components: generation, transmission and distribution, being divided 28 per cent for generation, 14 per cent for transmission, and 59 per cent for distribution.

In general, a good job has been done on the generating stations. Attention has been focused on the engineering and building of these because they represent large investments and these investments are made at one time. In the past 20 years, the cost per kilowatt of building a large station has decreased, even in the face of providing more elaborate means of retrieving BTU's by the use of super heaters, economizers, and the like. Meanwhile, the amount of coal has been cut from 3 pounds per kilowatt-hour in 1920 to a low of 1.31 pounds in 1942.

We can expect some further decrease in fuel cost but it will be slight considering the over-all cost of a delivered kilowatt-hour. The possible further decreases in station cost are also small.

Transmission systems also have been built up of relatively large incremental investments so that considerable effort has been concentrated on the engineering and building of these lines. The net result is that little reduction can now be made in the transmission system. The capacity of a few systems can be increased by addition of high-speed relaying and by revamping breakers for faster operation. Series capacitors can be used to neutralize the reactance of the system where the conductors are large enough to carry the increased load. The total possibilities for savings in transmission, however, are minor in comparison to what has already been done.

### Distribution Largest Item

Approximately 58 percent of the cost of an electric light and power system is in distribution. In general, distribution systems have been built up of small increments, sometimes purchased by different branches of the utility organization and put together and operated. The tendency has been to emphasize perfection of service.

Some of today's standards of distribution are predicated on apparatus as it performed 20 years ago. Consideration should be given to the modernization of our thinking on the system as a whole and particularly the distribution system, taking these factors into account. I believe it is possible to minimize the equipment in the distribution system to lower costs when making changes or extensions and still retain the quality of service demanded.

In thinking of how to lower distribution costs a number of schemes are available. The central-distribution substation can be used or small distribution substations can be distributed at many points on the system. In feeding industrial loads, loop feeders with elaborate tap point equipment can be used or radial feeders with multiple feed or a number of combinations with their varying degree of cost can be used. The selection will depend on the importance of the customer process and the size of load. Again in the residential and commercial areas, consideration can be given to radial systems, low voltage network systems, or primary network systems, depending on the load density and the type of service to be furnished. In other words, there are a large number of schemes which can be used in furnishing service to your customers, no one of which is the universal answer.

A typical distribution substation, which will be substation "A", is provided with multiple high-tension buses and main and auxiliary breakers on the secondary bus and a transfer bus for cutting regulators in and out of service as shown in Fig. 4. Also, single-pole operated breakers have frequently been used so that one line is opened on a single-phase fault. In other words, with a 2000-kva feeder only 666 kva would be lost for a single-phase fault.

For the purpose of discussion, the equipment cost of this station will be taken as 100 per cent or $22 per kva of firm demand at the substation (which will be the basis of comparison of all kva costs). This station does all that a distribution substation should do but its cost is high.

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*An address before the annual meeting of the Edison Electric Institute, in New York City, June, 1944. Mr. Monteith is manager industry and engineering for Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

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## Typical Distribution Substation A

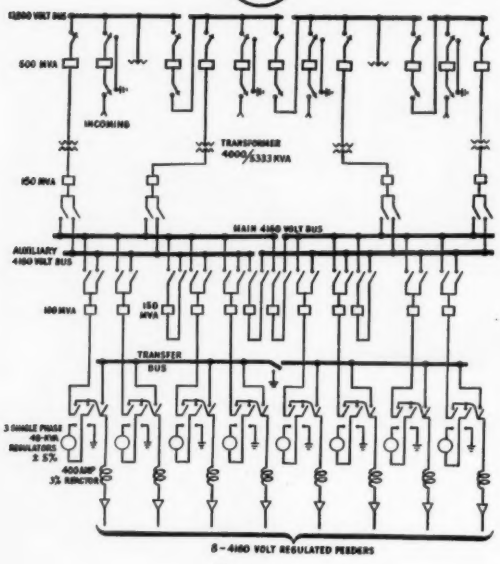


Fig. 4.

## Typical Distribution Substation B

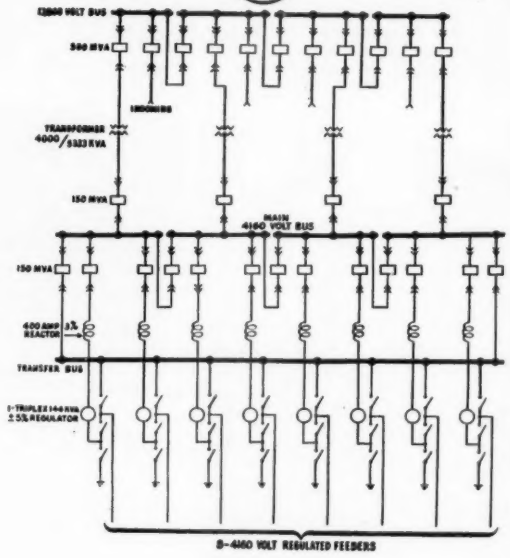


Fig. 5.

Some of the features that lead to its high cost are: the use of single-pole switching on the 4-kv primary feeders and the individual voltage regulation on any phase. Most companies have found these refinements unnecessary. The use of 4-kv auxiliary and transfer buses and the many disconnecting switches, to minimize the time of a service outage should a failure occur in a substation, and to facilitate maintenance of equipment, is expensive. In the light of equipment available in the 20's, this might have been justified, but with modern equipment this station is more elaborate than necessary.

The introduction of standard metal-clad switchgear with removable multiple-operated, three-pole breakers and the use of triplex regulators result in considerable saving. Substation "A" has been modified to permit the use of this modern equipment which becomes substation "B" shown in Fig. 5. This substation and the one of Fig. 4 are identical in performance except for three-phase feeder operation instead of single-phase operation. This results in a substation cost of 63 per cent or $14 per kva. Installation cost, although lower than that for the first substation, will be relatively high when building and wiring costs are included.

In addition to the use of modern standardized equipment, further cost reductions may be made by changing the fundamental substation diagram. Substation "C", Fig. 6, illustrates this point and can be used in building new substations or rebuilding old ones. Except that no 15-kv substation transformer breakers are used, the 15-kv switchgear layout is basically the same as that of substation "A". It has been modified only in detail to utilize standard metal-clad switchgear. Beyond this point, however, this substation is unlike substation "A", since there is no 4-kv bus in this substation.

With this type of distribution, employing relatively large circuits, facilities must be provided outside the substation on the 4-kv feeders for switching the load of any feeder to two or more adjacent feeders so as to restore service quickly following a feeder failure. Because these facilities must be available elsewhere in the system, even a 4-kv transfer bus has been omitted from substation "C". External switches are utilized when it is necessary to take a substation transformer out of service. Any circuit breaker can be withdrawn from its compartment and the spare breaker inserted.

The outstanding advantages of substation "C" are simplicity, unit design with accompanying flexibility for load change, decrease in possible 4-kv short-circuit current and the accompanying system voltage disturbance, lower losses, and its lower cost. The equipment for this substation will cost approximately 54 per cent of that of substation "A" or $12 per kva.

The appearance of this equipment when installed in a substation building is shown in Fig. 7. The high-voltage, metal-clad switchgear with air circuit breakers extends across the front of the building. To it are bolted the feeder units, each consisting of an air-cooled transformer with automatic tap changing under load and a 4-kv air circuit breaker. The use of air transformers permits installation of all equipment indoors. This makes possible the unit type of construction shown where all connection between the different pieces of equipment are made with short sections of metal-enclosed bus. This type of equipment eliminates many potheads, cables, and conduits required when oil-cooled transformers are used outside the substation building. This type of construction allows complete flexibility in the installation of equipment as the load grows or the moving of equipment should the load decrease.

The location of all the substation equipment indoors naturally raises the question as to the size of the building required to house it. From Fig. 8, showing the floor plan of a building to house substation "A"

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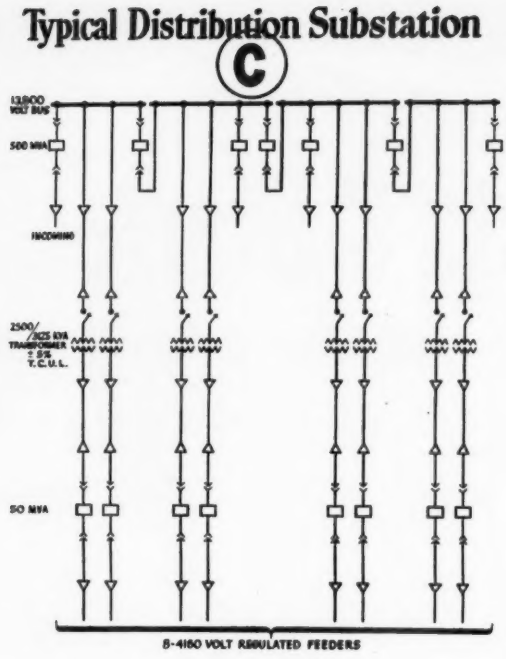


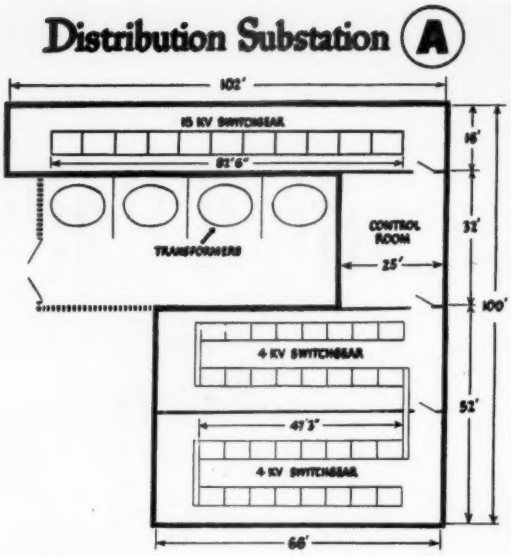


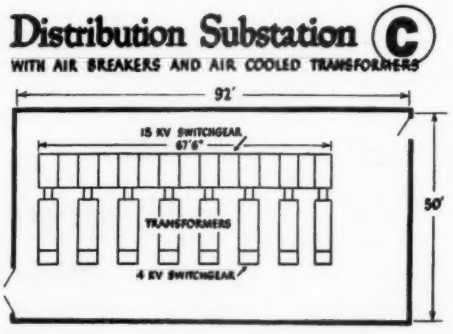


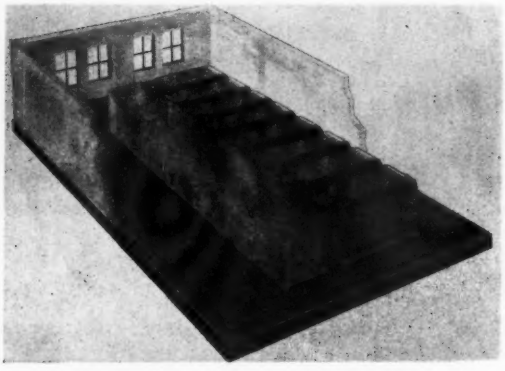

Upper left, Fig. 6
Left, Fig. 7
Right, Fig. 8

and substation "C", the considerable difference in apparatus costs and cost of installation is apparent.

The transformers and voltage-regulating equipment of substation "C" cannot be as conveniently de-energized for maintenance as in the case of substation "A" without the dropping of load. This is because, as pointed out, load must be switched outside of the substation from one feeder to others. Where external feeder switching equipment is not available, this substation can be modified to substation "D", as shown in Fig. 9, to include a transfer bus, thereby permitting all switching for maintenance of station equipment to be done in the station. Thus, to obtain the greater convenience for maintenance provided in substation "D" as compared to substation "C", the station equipment cost has been increased approximately $2 per kva, with a slight increase in building and installation costs.

This discussion so far has been directed to indoor substations. However, these substations can be constructed with outdoor equipment. In the case of substations "C" and "D", the equipment arrangement and cost will be approximately the same whether installed indoors or outdoors. Outdoor oil-insulated transformers have been substituted for the indoor air-cooled transformers. The substation space will be increased about 25 per cent because of the increased size of the outdoor transformers.

Where new designs and the greater reliability of equipment and lines are taken into account, combining installation and equipment costs result in a substation costing less than 50 per cent of that of the more elaborate substations designed and built on the basis of former service records and experience with the older types of equipment.

Why, then can substations "C" or "D" be considered when substation "A" was once deemed necessary. Reviewing the data given on reliability of apparatus and lines, the 4-kv cables have only about one-third the probability of failure now that prevailed in the 20's and transformers have been improved even more. This alone justifies a change from single phase to three-phase operation as the outages per customer caused by cables and transformers should be about the same or even less. The complicated bus arrangement of yesteryear was provided so that feeders could be switched in case of failure of equipment in the substation itself. The probability of failure of equipment in the substation has been minimized because of the complete factory testing. Metal-clad switchgear with complete enclosure of all live parts, air-insulated transformers

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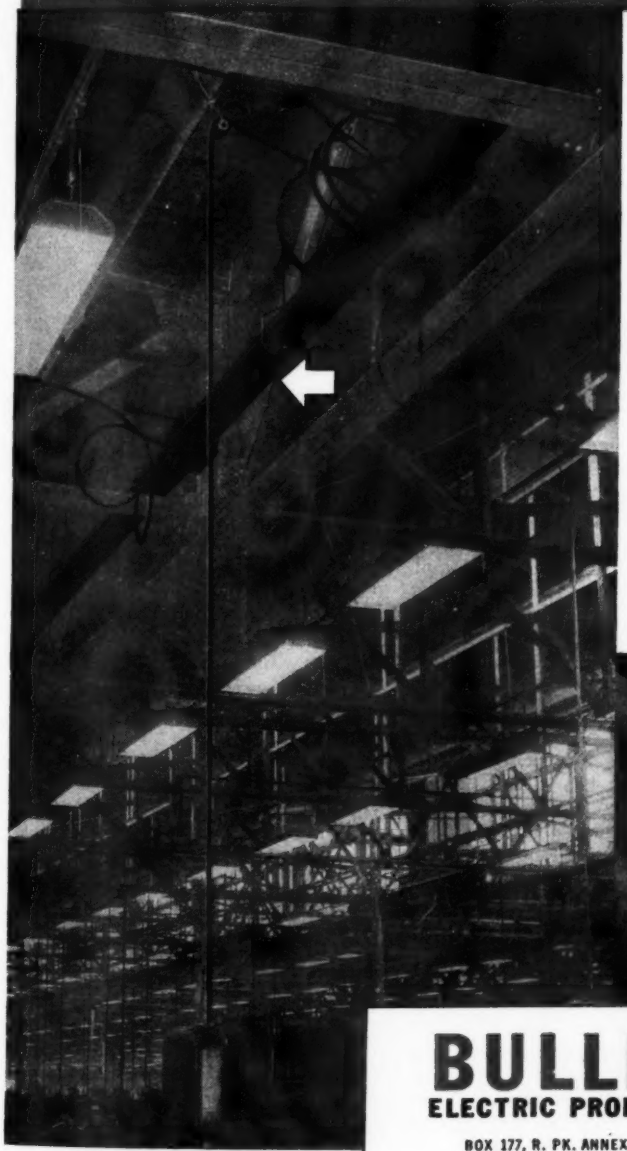

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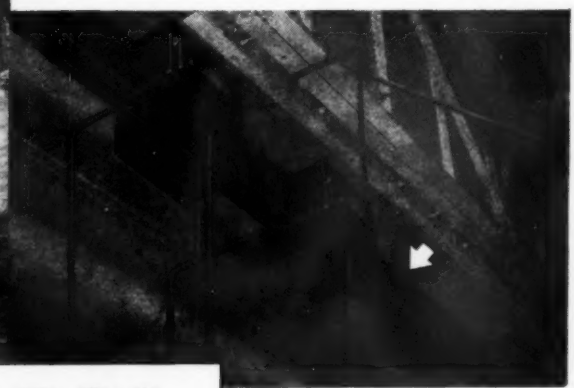

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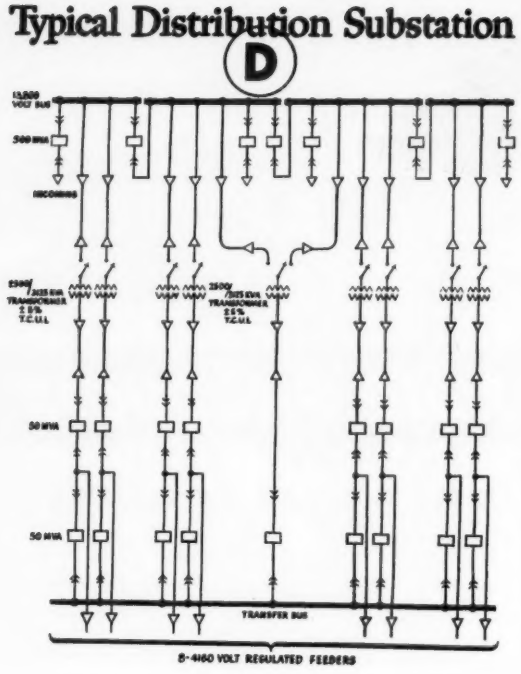


Fig. 9.

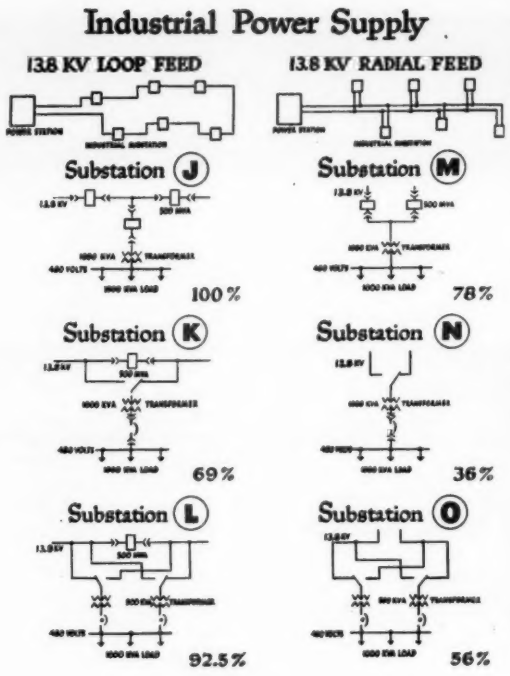


Fig. 10.

with tap changing under load, and air circuit breakers throughout allow placing all the equipment together in one building. The necessity of single-phase regulation in all cases is questionable.

These same arguments hold for open lines as for cables. Overhead lines are now being built with self-clearing characteristics, but if faults still persist, the vast majority are cleared by de-energizing the feeder and service is automatically restored in a few seconds.

### Industrial Power Supply

Another opportunity for economy is in the equipment for distribution systems serving small and medium-size industrial customers. Many of these are supplied from high-voltage loops as shown in Fig. 10. One practice is to supply each of a number of industrial substations with equipment as shown in substation 'J", which will be the basis of comparison for all schemes. This and all other substations in Fig. 10 are designed to serve an industrial customer having a load demand of 1000 kva.

Substation "J", costing $22 per kva, provides excellent service to the customer. A loop fault on either side of the substation does not cause any interruption to service. A failure of the transformer will, of course, interrupt the power supply until a good transformer is connected in its place. Transformers are so reliable, however, that additional expense cannot normally be justified to prevent a service interruption that will probably not occur during the life of the substation. Substation "J" probably gives better service continuity than can be economically justified for many industrial customers.

The probabilities are that a fault will occur about once every five years on one of these industrial loops. If so, substation "K" costing about $15 per kva or 69 per cent of substation "J", can be used to provide adequate service to the great majority of industrial customers. If a fault occurs on the 13.8-kv loop to the right of substation "K", the customer's power supply is interrupted but his service can be quickly restored by opening the circuit breaker in the secondary leads of the transformer, closing the transformer primary switch to the left to connect the transformer to the good section of the 13.8-kv loop, and reclosing the air circuit breaker. Except in this one case of trouble, which probably will cause interruption only once in 15 to 20 years, substation "K" provides substantially the same quality of service as does substation "J" and has an overall saving of about 30 per cent.

The few customers requiring best possible service continuity can be supplied most economically through substation "L". This substation gives somewhat better service than substation "J" at an equipment cost of approximately 92.5 per cent or about $20 per kva. By using substation 'K" for 90 per cent of the industrial customers and substation "L" for 10 per cent of them, instead of using substation "J" throughout, an aggregate saving in industrial substation equipment cost of 29 per cent can be made.

A further saving in investment can be made by using two radial feeders to supply a group of industrial customers, as shown on the right of Fig. 10. Using this radial supply scheme, the length of cable required will be anywhere from equal to about 50 per cent more than that required when using the loop supply, depending upon the geographical location of the customer served. The possible reduction in size of cable and the fact that both radial feeders can be carried in one duct bank, however, will make the cable supply costs for either loop or radial feeder about equal. Therefore, the savings in substation costs when using the radial supply represents a net saving.

Substations "M", "N", and "O" are comparative to those discussed for the loop feeders. When using the radial feeder and substation "N" for 90 per cent of the custom-

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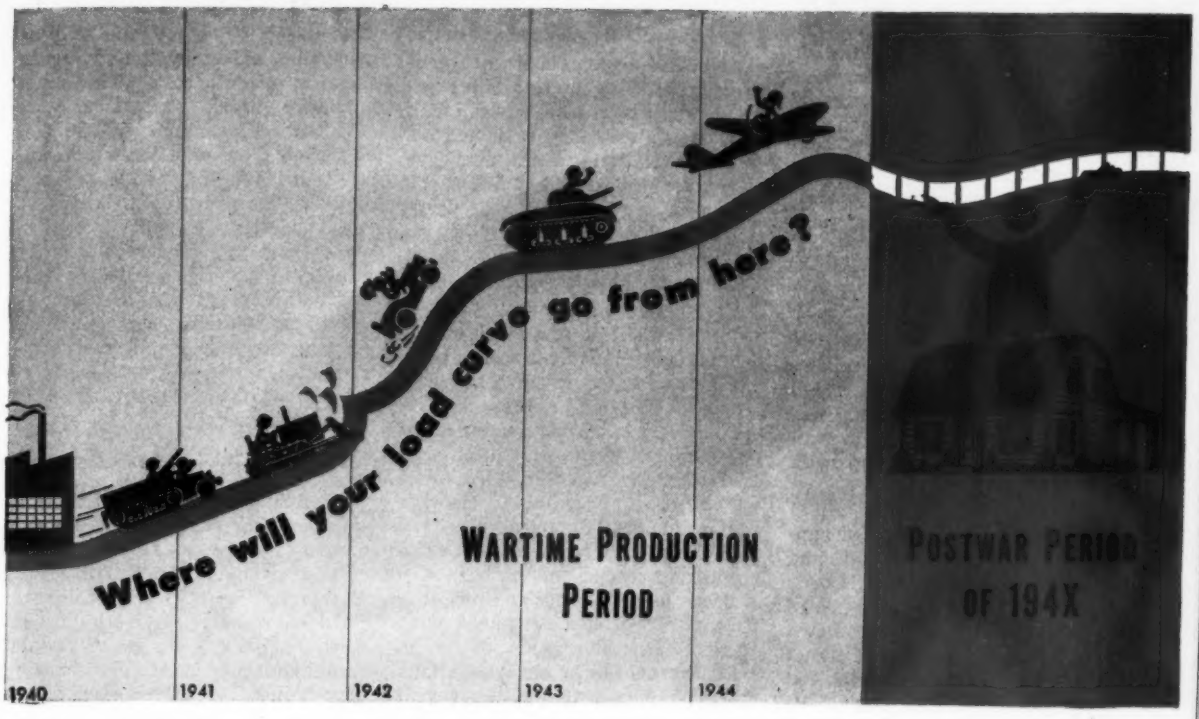


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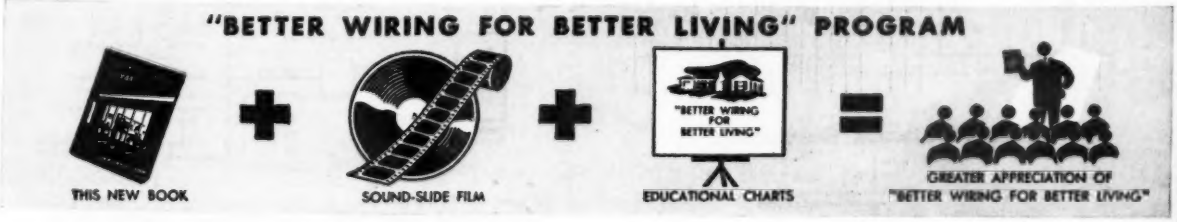
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ers and substation "O" for 10 per cent of the customers, a saving of 62 per cent in substation equipment cost is made when compared with using the 13.8-kv loop feeder and substation "J". Even if substations "K" and "L" are used, as recommended with the loop feeder, the saving in substation equipment cost is 47 per cent if the radial feeder and substations "N" and "O" are used.

The radial feeder and substation "N" make it economical to supply in this manner many small industrials now supplied through the large distribution substations along with the residential and small commercial customers. This will release distribution substation capacity for residential load growth.

### Primary-Network Distribution

The predominant method of supplying power to residential and small commercial customers is over radial circuits from relatively large distribution substations, as shown in Fig. 11. To secure the best economy with such a distribution system the substation should be located near the load center of the area it serves. If this is not done, the lengths of the main 4-kv feeders become excessive. This increases both the investment in these circuits and the system losses, which are reflected in increased operating cost.

The substation must be located and built before the area it is to serve is well developed. Because distribution-system loads are continually growing and shifting unpredictably, a substation can seldom be located where it should be, to economically serve its load five or ten years after it is built. Also, to move a large distribution substation and make the necessary circuit rearrangements to meet changing load conditions is expensive.

The primary-network system is more flexible. In it a much larger number of relatively small substations are located at or near what would be the load centers of the 4-kv feeders in a system using large substations. These substations are tied together on their 4-kv sides, as shown in Fig. 11, to provide service at least comparable to that rendered by the radial system. The equipment cost of one of these substations using outdoor equipment is about $11 per kva compared with $12 for large substation "C". The fact that these small substations can usually be located outdoors with only a fence or a wall around them makes their cost advantage even greater, because the large substation building cost must be added to that of its equipment.

When using a primary-network system, the cost of the 13.8-kv circuits will usually be greater than when using a radial system such as we have been discussing. In most cases, however, this will be more than offset by the saving in the 4-kv circuit cost. The small primary-network substations can be installed when needed and can be moved from one location to another as changing load conditions dictate. Thus, system investments can be made to follow load requirements closely. Lower losses are also in favor of the primary network. The primary network should be seriously considered for serving residential and small commercial customers whenever a system extension or major change becomes necessary.

### Secondary Network Distribution

Secondary-network systems in areas of high load density are now accepted. Greater use of this type of system could be made to lower distribution costs. Small commercial loads with relatively high load density exist in many spots throughout city areas. These areas, now being fed through distribution substations as shown in Fig. 12, can be given better service in many cases at less cost from small secondary networks supplied directly over 13.8-kv circuits of the type shown in the figure.

The secondary network elimi-

(*Continued on page 88*)

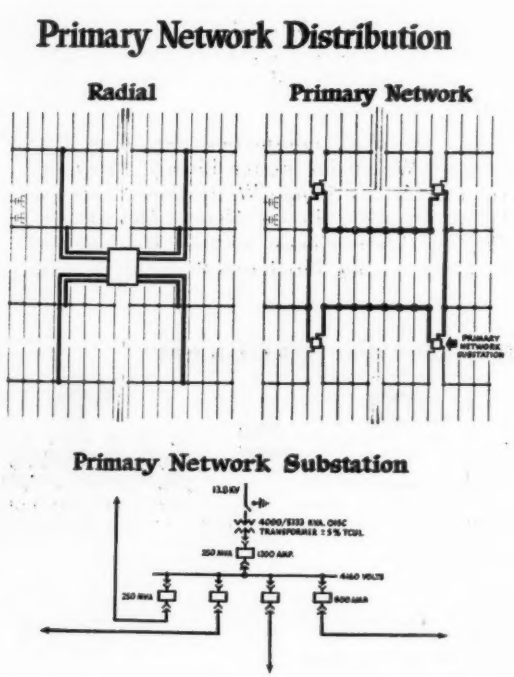



Fig. 11.

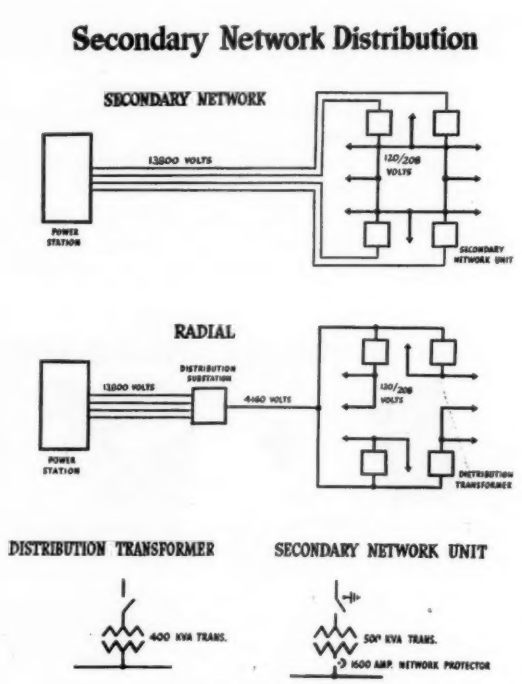
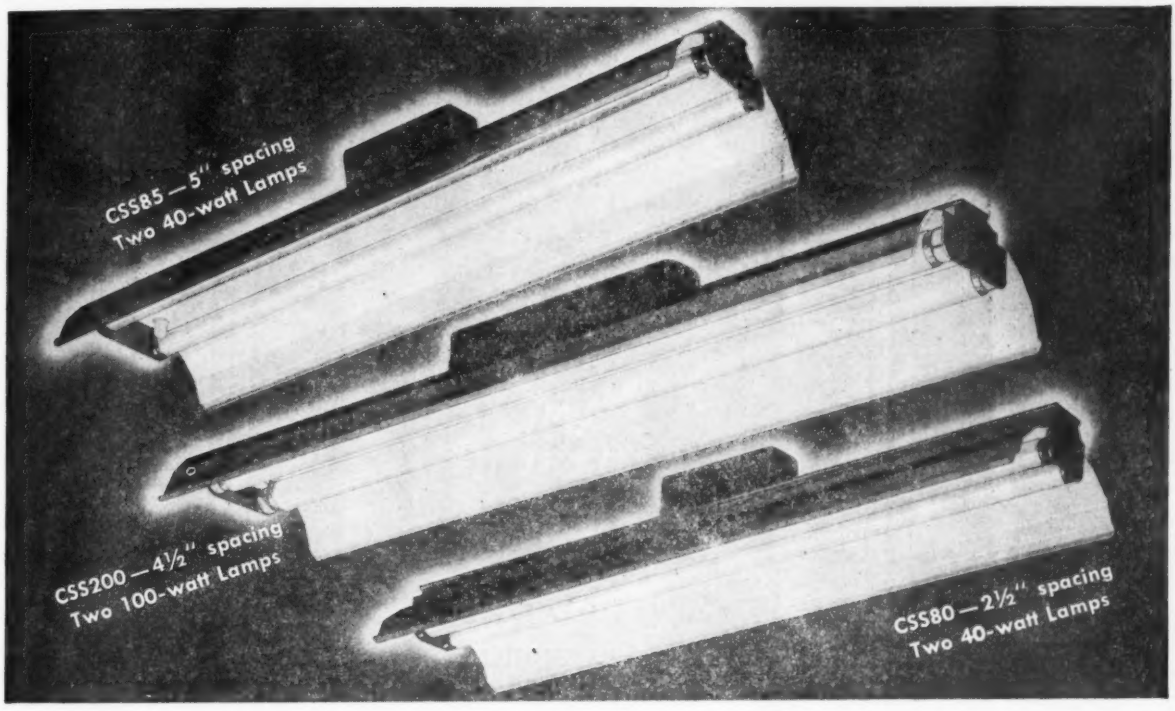



Fig. 12.

# Industry will go for these *New* HOLDENline Fluorescents




## —*and this is why*

Engineered by pioneer-in-Fluorescent HOLDENline, produced by HOLDENline's own shops, these fixtures feature high efficiency, freedom from service costs, plus flexibility. The conversion from individual to continuous run is simple and quick.

**New, "Butt-on" Sockets** eliminate all breakage in shipping and handling. HOLDENline mounts sockets on heavy steel plate that firmly supports them to channel. Socket spacing always positive.

**Lamps are positioned** further away from reflector increasing overall efficiency.

**Spacing**—No dark areas between lamps. Applies to Nos. CSS80 and CSS200 . . . 2½" spacing on CSS80; 4½" spacing on CSS200. Try the handkerchief test on them. (5" spacing on CSS85 only).

**Polymerized Synthetic Finish** on steel reflectors guarantees much higher reflection factor, longer life, easier maintenance. Vitreous porcelain furnished at additional cost when specified.

**Exposed Ballasts** insure longer life, cooler operation; fewer replacements.

**Versatile Mounting** to fit any need—built into raceway; results in savings on mounting cost.

**Triple-Tested HOLDENline Units** are lighted not once but *three* times on 110 volts—must stand up under 1200 volt breakdown test.

**Instant Starting** equipment optional.

*Write for new folder telling all about these new HOLDENline products.*

**Sold only through wholesalers**

---

# THE HOLDENLINE COMPANY

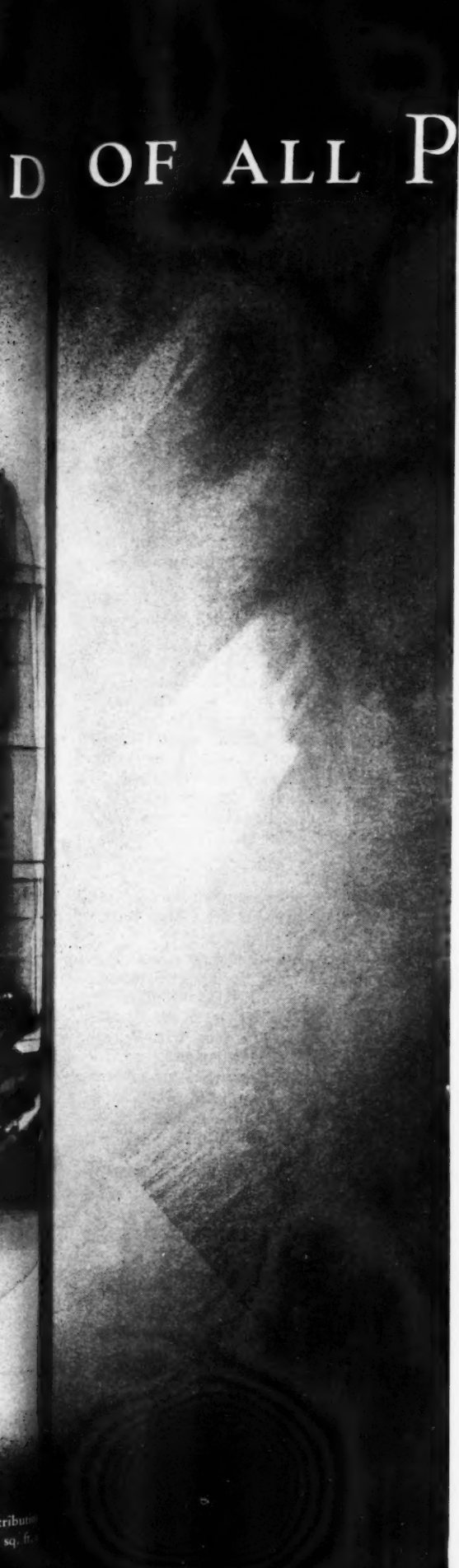
*Pioneers in Fluorescent*

**1960 EAST 57TH STREET • CLEVELAND 3, OHIO**

# RESEARCH...SPEARHEAD

The 80 practical specialists who work in this magnificent building at Bayonne, N. J., have every facility—chemical, physical, metallurgical—to aid them in bringing nearer their goal—extending to the utmost the effective means of electrical transmission and distribution. Built in 1941, the structure has already grown to 60,000 sq. ft. floor space—is planned for further expansion as needed.

D OF ALL PROGRESS...



**THE FIRST GREAT LABORATORY DEVOTED EXCLUSIVELY TO RESEARCH ON ELECTRICAL WIRES AND CABLES**

. . . thus "basic research in a particular industry devolves naturally upon the leading manufacturer." General Cable has been alert to its responsibility. In this great Laboratory are maturing the insulation discoveries and product developments which will loom large in days ahead.

# GENERAL CABLE CORPORATION

*Manufacturers of Bare and Insulated Wires and Cables for Every Electrical Purpose*

# NEWS of the INDUSTRY
## National and Southern

### Postwar Home Lighting Featured at IES Meeting

Recommendations for the lighting of many phases of postwar living, based on the findings of leading authorities, was an important feature of the Technical Conference of the Illuminating Engineering Society, in Chicago, September 14-16. Specialists in the illumination of homes, schools, stores and industrial areas, as well as military and technical men in the field of lighting, assembled at the Edgewater Beach Hotel, in Chicago, for three days of serious discussion of these important subjects. Their program included, among other technical papers presented:

"A Recommended Practice of Home Lighting". (Many excellent recommendations and suggestions for lighting the home have been made by manufacturers of lighting equipment. For the first time in ten years, however, official and unbiased recommendations have been established, based on the studies of the Committee on Residence Lighting of the Illuminating Engineering Society).

"Trends in Aviation Lighting". (A paper presented by Major Wilbur T. Harding, of the United States Army Air Corps, who is eminently qualified to discuss the lighting of airports and aviation areas).

"A Recording Microphotometer—Its Application to the Design of Reflector Type Gun Sights"—"The Influence of Lighting on the Posture and Health of School Children", by a member of the Texas State Department of Health—"A Symposium on Post-War Store Lighting"—were other subjects covered in the technical sessions of the Conference.

In accordance with the seriousness of the times, the Illuminating Engineering Society "streamlined" its program to the important essentials only, and the lighting specialists attending it had a full schedule of committee meetings, held even during breakfast, lunch and dinner periods.

**"I think it's that new transparent plastic refrigerator that Experimental Electric has been working on."**

---

### Georgia Power Postwar Merchandising Policies

Merchandising plans for the Georgia Power Company are concisely stated in a new booklet developed by A. W. Harris, supervisor of dealer coordination, and intended to help the electrical appliance dealer plan his post-war merchandising program.

To make clear the company's policy in postwar merchandising, the booklet states that "at the present time it is the intention of the Georgia Power Company to merchandise a reputable line of major appliances as soon as they are available. In the small appliance field, the company will promote and sell several lines of appliances. The company will offer no cut prices or excessive trade-in allowances.

"Guarantees of new appliances will conform with the manufacturers' guarantee of their appliances. Trade-ins, repossessed and used appliance guarantees will be established under a specific procedure. Obviously this procedure cannot be established now as it is dependent upon the policies of manufacturers and existing conditions at the close of the war. However, it will be determined to conform with sound business methods and the procedure recognized nationally by the electric industry. Policy in regard to trade-ins will be sound and ethical."

The main objective of the company's future merchandising program will, therefore, be two-fold: (1) To aid in retaining the past public acceptance of electric appliances over new products and fuels. (2) To develop new markets more aggressively for the new appliances and new applications of electricity.

Primarily intended to help the

# the little man who's always there

**A roll of Security Friction Tape in the tool box or on the work bench is just as good as having a "Johnny-fix-it" around to splice electric wire and make emergency repairs. "Security" is always ready to "take hold" on construction or assembly jobs involving electrical connections, or to turn to wherever there's an emergency need.**

*Listen to the Philharmonic-Symphony program over the CBS network Sunday afternoon, 3:00 to 4:30 E.W.T. Carl Van Doren and a guest star present an interlude of historical significance.*

## UNITED STATES RUBBER COMPANY

1230 SIXTH AVENUE • ROCKEFELLER CENTER • NEW YORK 20, N. Y.

US — UNITED STATES RUBBER COMPANY — TRADE MARK

*SERVING THROUGH SCIENCE*

# New G-E Service Training

**Previous courses were attended by more than 18,000 servicemen—the *New* School will further increase the G-E dealers' lead in the postwar market.**

• • •

Your distributor is organizing G-E Service Training meetings in your vicinity. He'll be in touch with you to let you know the time and place. Ask him about the "T" Plan and other G-E service helps.

### Brand-new material

Much important new service information will be presented in this series of meetings. Among the features will be:

- A slide film on washer wringers. The repair procedure for the W-1000 wringer will be covered in detail. And a script book will enable you to take the story home after viewing the film.
- A slide film on the new FEA Refrigerating Unit. The major mechanical features and servicing procedure will be presented. This is a "must see" picture! Also complete with script book.
- Small appliance shop-repair manual. For the first time, in one manual, detailed shop instruction is made available on irons, coffee makers, toasters, percolators, roasters, mixers, and cord sets.
- G. E. in the Low-Temperature Field . . . Postwar. You'll get a preview of General Electric's plans for Home Freezers and other low-temperature equipment.
- New Refrigerator Operating Manual. This fine new manual covering all models is intended for customer distribution. You'll find it an excellent good-will builder.
- Discussion of Postwar business. You'll find it helpful to know of prospects for business after the war . . . and what G. E. is doing now that should help in the postwar era.
- And many other additional subjects, both new and review, crammed full of profitable information.

Movies, slide films, and expert instructors will give a review of major appliance repairs . . . high spots taken from previous courses.

### "T" Plans

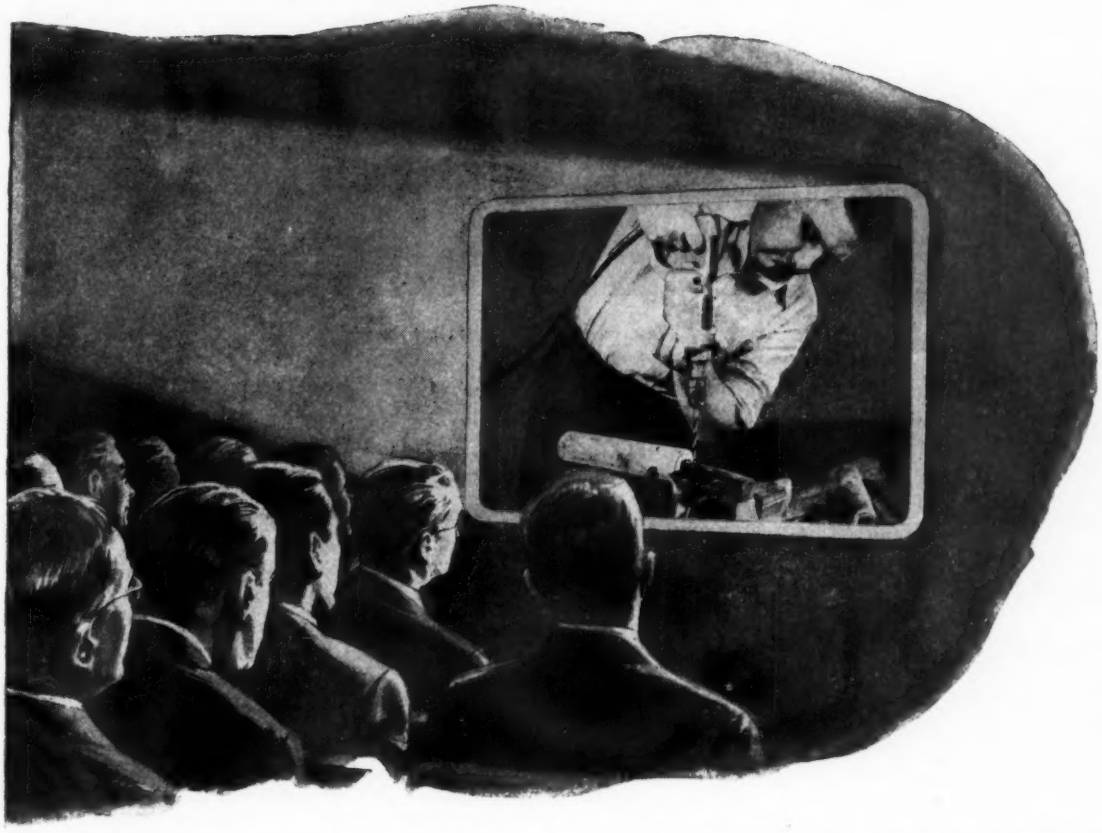
General Electric has left no stone unturned to provide every bit of information needed to make service business profitable. The "T" Plans are another example of this. These are the home-study courses . . . already taken by more than 4000 servicemen.

The first "T" Plan covered G-E refrigerators. It was received so enthusiastically that it was followed up by a Plan on G-E ranges. General Electric plans to continue this practical form of instruction.

### Plus plenty of printed helps

General Electric has spared no expense to provide complete guides for your service work. First, there's the "PRODUCT MAN"—a monthly service magazine which totalled more than 500 pages of valuable service aids in 1943. More than 4000 dealers get this

# School starts in October



magazine. Be sure you are a subscriber. Price, $1.50 per year.

In addition, there's the new service manual on G-E Scotch-Yoke refrigerators. And, of course, there's the Appliance Service Handbook—a 214 page service story on all General Electric major appliances. More than 10,000 copies have already been distributed.

No matter what G-E product you're interested in, there's service information available.

**An opportunity you can't afford to miss**

These new G-E Service Training meetings will help you make the most of your repair business now and after the war. They have been planned to bring you a wealth of service information on many G-E lines.

The postwar battle for business is bound to be a hard one. General Electric is offering you the opportunity to get set for a bigger share of the appliance business by training yourself now. ***General Electric Appliance and Merchandise Dept., Bridgeport, Conn.***

**TUNE IN:** *"The G-E All-Girl Orchestra," Sunday 10 p. m., E. W. T., NBC. "The World Today" news, every weekday, 6:45 p. m., E. W. T., CBS.*

**FOR VICTORY**

General Electric is working night and day to speed the attack.

You can help, too, by buying and holding more War Bonds than before.

Everything Electrical for After-Victory Homes

**GENERAL ELECTRIC**

electric appliance dealer plan now for merchandising after the war, the booklet tells how the company is desirous of helping the dealer to build his volume of trade as well as its own. Ways in which the company desires to help the dealer are listed:

(1) The company will endeavor to provide or make available an equitable financing plan to dealers for the sale of their appliances.

(2) Provision will be made for the training of salesmen and appliance repairmen for dealers.

(3) Equipment operation and instruction will be made available to the customers of dealers by the company's home service personnel.

(4) Promotional aid will be extended to dealers who desire assistance in organizing special campaigns and activities, in providing adequate wiring and kitchen planning information for their customers, and in conducting prospect schools.

(5) Advertising help in planning and producing regular newspaper or special copy will be furnished by the company's experienced advertising personnel. Advice regarding displays and the best media to use, will be made available to the dealers.

(6) Certain company representatives will be assigned to dealer work. Their duties will consist of representing the dealer's interest in company policies and advancing the dealer's appliance business in every way possible.

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## "U[illegible]n for V Day" En[illegible] Second Phase

C[illegible]ating six months experien[illegible] their now nationally acce[illegible]" P'an for "V" Day prom[illegible]on, Universal has annou[illegible] the second phase of this bro[illegible] dealer postwar planning prog[illegible]m.

W[illegible] 16 000 dealers from coast-to-c[illegible] now promoting the plan, incl[illegible] 92 department stores, 63 [illegible] companies, 2,100 furniture [illegible]res, 4,000 hardware dealers, 3 800 radio-appliance stores and [illegible]y 6,000 specialty dealers, it i[illegible] estimated through survey that [illegible] plan has created over 150 0 0.000 consumer impressions and developed a potential volume of dealer postwar orders in excess of $50.000,000.

Emphasizing that the "U" Plan for "V" Day goal is to prepare every dealer in the nation selling household equipment for the day when merchandise would be released, W. J. Cashman, director of promotion and publicity, and author of the plan announces:

"The second phase of the "U" Plan for "V" Day is ready. While the first phase of the plan brings dealer and consumer together for postwar transactions, phase two has as its goal the strengthening of the dealer's physical structure and organization to assure better merchandising in the postwar era. It will proceed simultaneously with the continued promotion of phase one of the plan offering many new dealer services which will be timed to help the dealer when he needs them most.

"Among these new services are:

**"Store Planning**—will help the dealer who is thinking of improving his store's appearance, with many practical suggestions of physical changes that are down to earth while providing him with a reference file of sources and ideas which he can employ to advantage in changing store appearance for better merchandising. This service will cover many phases of store planning appearance with sections devoted to store layout, store fronts, interior designs, floors, materials, supply sources and other important matters.

**"Planned Selling**—will aim at providing intelligent suggestions to help the dealers promote postwar merchandise in a more efficient manner. Advertising, direct mail, display and floor sales techniques will be covered in this service which will bring to the dealer many new ideas that have grown out of merchandising since the war began.

**"Sales Training**—Universal University will provide "U" Plan dealers with dynamic, aggressive sales training courses which will help select and train dealer salesmen of tomorrow to create a larger volume of sales in a more efficient manner.

**"Informative Labeling**—will include many important and novel ideas in labeling merchandise for faster, easier selling in the store, and will cover in its scope many new techniques in the ticketing and display of merchandise to create better marketing control, faster turnover and larger volume.

"The first phase of the "U" Plan for "V" Day provided a simple formula for pre-selling consumers postwar household equipment that is not available today," explained Mr. Cashman. "This formula through large scale national advertising has crystalized consumer thinking about postwar appliance purchases and then through a series of easy steps led the consumer to the dealer's store where the consumers postwar wants are being registered with the dealer for prompt supply when merchandise is again available. Through national promotion by the manufacturer and local pro-

Plan Now FOR THE THINGS YOU'LL NEED AFTER VICTORY
U plan for V day
COME IN AND GET YOUR HANDY CHECK LIST TODAY!
BUY MORE WAR BONDS
Makes it more than WISHFUL THINKING
UNIVERSAL

**Material available to dealers through the "U plan" program.**

## Let it help you serve your customers!

DESIGNED for high quality fluorescent lighting at lower cost, the BEACON is a "honey" for lighting essential offices or drafting rooms. Provides smooth, shadowless light to help handle paper work faster and reduce eyestrain.

Maintenance is especially easy since there are no horizontal surfaces on which dust can collect. New rigid design louvers hinged to make lamp replacement easy.

Etched, ribbed glass on the side panels gives smooth, pleasing light; louvers on the bottom of the unit prevent direct view of the lamps.

The new BEACON is of all-steel construction. Metal end caps are pierced in a decorative design and are backed up with diffusing, translucent plastic. And you can offer this 4-lamp fluorescent unit in stem suspension as pictured, or with close-up mounting for low-ceiling areas. Get the details NOW from Graybar or write us.

★ ★ ★

HELP PREVENT INDUSTRIAL ACCIDENTS . . . GUARD MOVING PARTS . . . HAVE GOOD LIGHT . . . BE ALERT.

ARMY (E) NAVY

THE F. W. **Wakefield** BRASS COMPANY

RED ● SPOT LIGHTING FOR WAR PRODUCTION . . . FOR PEACETIME FUTURE

VERMILION, OHIO

motion by the dealer, the plan has today created intelligent postwar planning among many members of the appliance industry.

"Dealers have been provided at no cost with a point-of-sale promotion kit that not only identifies their stores as "U" plan headquarters, but also furnishes them with all necessary materials for point-of-sale promotion of the plan.

"To date, Universal has issued over 30,000 copies of its "U" plan prospectus . . . sent to dealers nearly 80,000 display and promotional pieces for local promotion . . . furnished several million dealer-consumer letters through its "100 Letter Plan" mail service . . . provided dealers with over 80,000 copies of "Dealer's Digest" information service and conducted over 200 jobber-dealer meetings and clinics from coast to coast to insure point-of-sale promotion for the plan."

**"You better go in and sort of prepare Barney—I doubt if he was expecting these!"**

## Water Heater, Dishwasher Production Standardized

To plan now for anticipated heavy postwar demand for electric water heaters and dishwashers, the Westinghouse Electric Appliance Division has formed a separate department to give increased emphasis to the development, improvement and marketing of these devices, T. J. Newcomb, sales manager, announced.

At the same time, Mr. Newcomb announced the appointment of M. M. Feaman, as manager of this new Water Heater and Dishwasher Department. These appliances previously were assigned to the Range Department.

Mr. Feaman is active is an industry-wide program to standardize electric water heater equipment — both electric heating elements and tanks — which it is expected will reduce the cost per unit because of more streamlined production methods of manufacture. A similar study of dishwasher design and production to achieve mass market requirements also will be undertaken.

Westinghouse anticipates that annual sales of electric water heaters and dishwashers during the first five postwar years "will for surpass the peak year of 1941." Mr. Feaman anticipates that electric water heater sales will more than double the previous high and that dishwasher sales will be at least eight times greater than the 1941 level.

Mr. Feaman has been with Westinghouse since 1931, spending the first seven years as merchandising supervisor in the Northwestern district, with headquarters at Chicago. From 1938 until the start of the war he was sales promotion manager of the Range and Water Heater Department, at Mansfield, Ohio. Since the war he has coordinated such wartime activities as the Westinghouse Health for Victory nutrition program used by more than 1,700 war plants and the company's Conservice schools for training service men and women in the repair of electric appliances.

## NEWA Appliance Division Headed by Robert Hill

Robert C. Hill has been appointed director of the Appliance Division of the National Electrical Wholesalers Association, according to an announcement by Charles G. Pyle, managing director.

Mr. Hill has a broad background and experience of over twenty years in the electrical appliance field. Formerly, he was assistant to the president of the Council of Electric Operating Companies, assistant sales manager of Philadelphia Electric Company, sales manager of Allen-Ingraham Company, and field director of the Association of Electragists.

The National Electrical Wholesalers Association's postwar plans are rapidly taking form following the extensive work of its Planning and Management Committees. In developing its new Appliance Division, it will serve all wholesalers interested in the merchandising of electrical appliances in all of its various phases and will cooperate closely with all other branches of the industry such as manufacturers, dealers or retailers and utilities on a national basis in meeting the postwar public demand for appliances.

The appliance membership in the Association is representative of the entire appliance distributing industry.

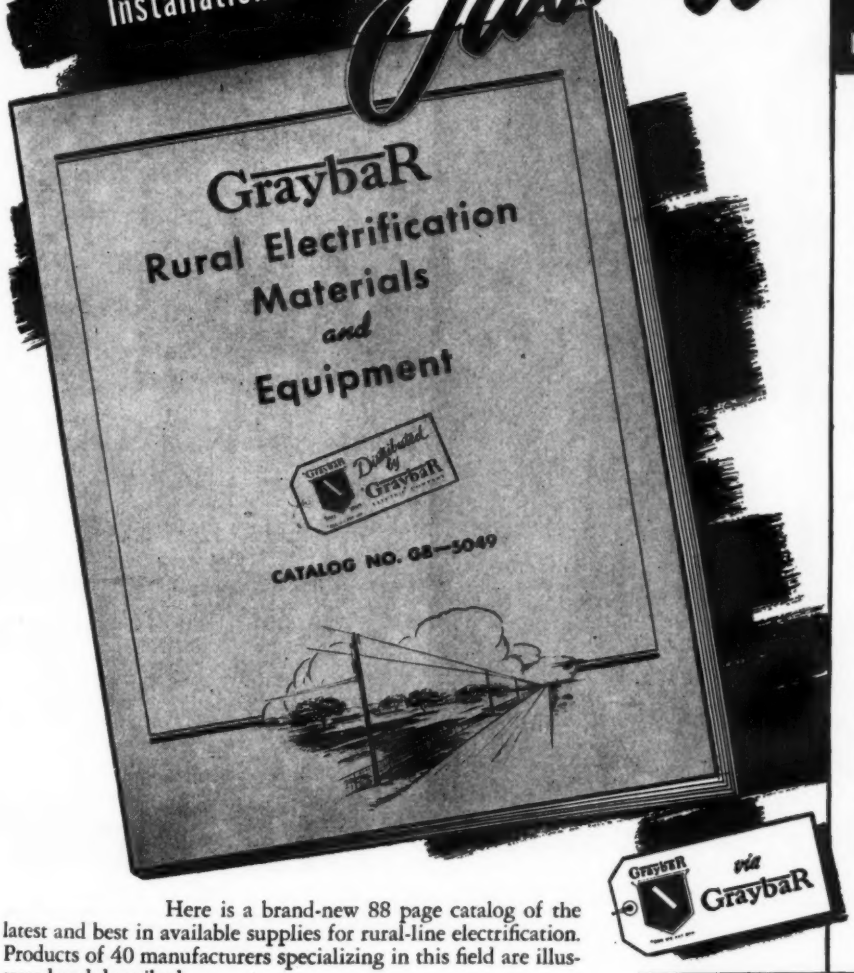
## Appliance Association Active in San Antonio

Officers of the Electric and Gas Appliance Association of San Antonio, Texas, were elected at the regular meeting held in that city, July 11. Those elected were: W. C. Rowles, Rowles Sales Company, president; T. A. Beniteau, Broadway Auto Supply Corporation, vice president; and Walter H. Meyer, secretary-treasurer, re-elected. Mr. Rowles succeeds A. C. Tinch, Sears, Roebuck and Co.

The association is one of the oldest and most progressive in

TIME-SAVING BUYING GUIDE With Valuable Installation Data

# Just off the Press




*Up-to-the-minute* LISTINGS ON THESE ITEMS

**Anchors . . . . Conductors . . . . Connectors . . . . Crossarms . . . . Hardware . . . . Hot Line Safety Equipment and Tools . . . . Insulators . . . . Line Construction Tools and Equipment . . . . List of Materials and Symbol Index . . . . Material Schedule Charts . . . . Meters . . . . Nicopress . . . . Pole Markers . . . . Poles . . . . Reclosures . . . . Rural Line Schedule Drawings . . . . Staples . . . . Strand . . . . Sub-station Equipment . . . . Tap Clamps . . . . Transformers, Cutouts, Arresters . . . . Twist Sleeves . . . . Voltage Regulators . . . . Wiring Supplies.**

Here is a brand-new 88 page catalog of the latest and best in available supplies for rural-line electrification. Products of 40 manufacturers specializing in this field are illustrated and described.

In addition, this catalog contains time-saving information on rural installation practices . . . . Nearly 40 drawings of typical rural-line structures . . . . A material schedule to facilitate ordering . . . . Data and materials for farm and rural wiring . . . . An alphabetical index . . . . A Graybar office index, with telephone numbers.

Your copy is ready. Just call your local Graybar Representative, or mail the coupon.

GRAYBAR via GraybaR

## *Your Copy is Ready.*

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420 Lexington Ave., New York 17, N. Y.

Please mail me your new Graybar Catalog No. GB-5049.

*Name* ..... *Title* .....

*Company* .....

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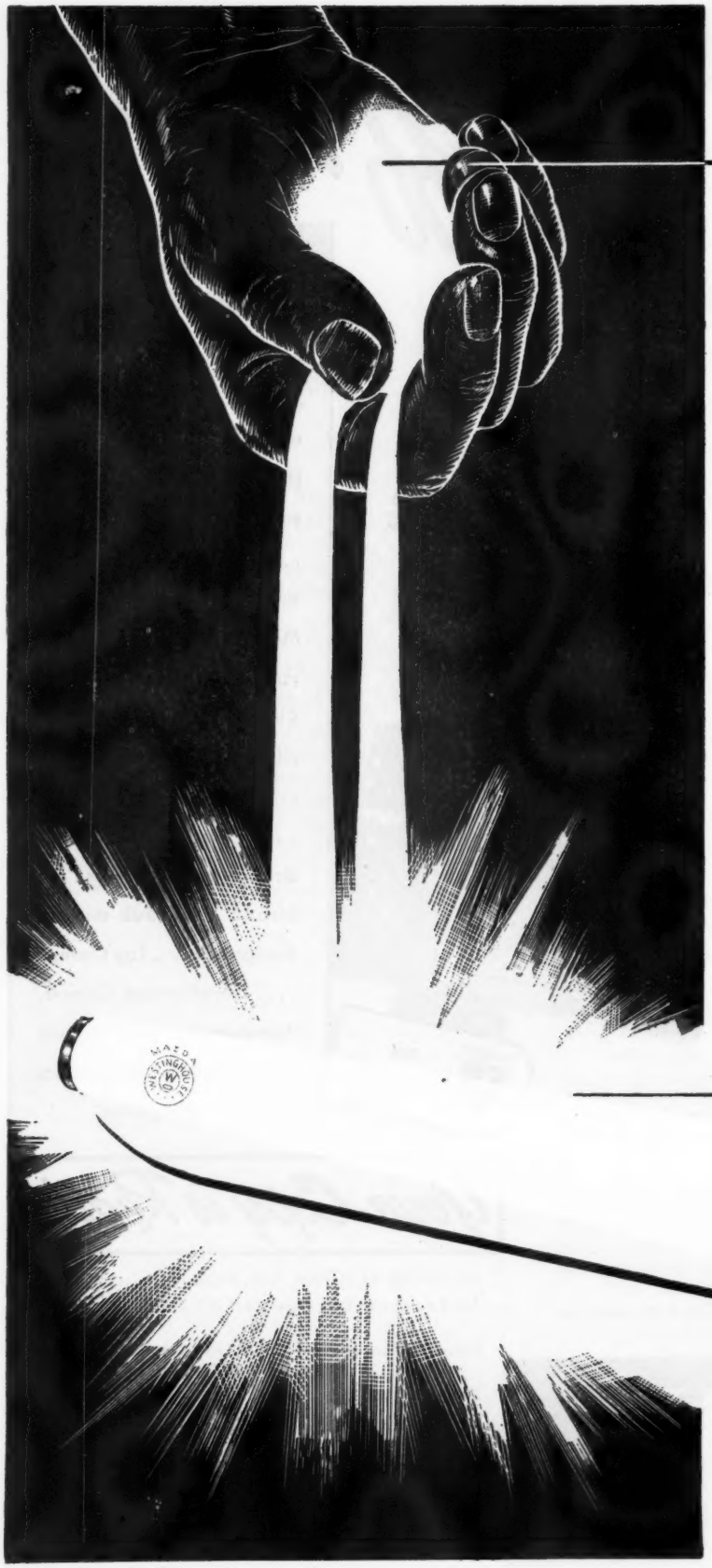
# GraybaR

IN OVER 80 PRINCIPAL CITIES

*Executive Offices:* Graybar Building, New York 17, N. Y.


THE MORE
THE MORE
MAZDA
WESTINGHOUSE
B-R-I-G-H-T
FROM END TO END

# SPARKLE IN THE POWDER . . .

The greater the care in selection and compounding of phosphor powders for fluorescent lamps, the greater the brightness from the lamp, and the more See-ability the lamp produces in service.

Westinghouse research engineers found, for example, that foreign substances in a batch —*just one part in a million*—make an appreciable difference in light output.

To eliminate these impurities, Westinghouse research has devised new and effective purification processes. A carefully planned and meticulously controlled routine of acid washing, high-temperature firing, grinding, mixing and blending, assures maximum purity and brightness performance in the finished phosphor.

Take advantage of this persistent Westinghouse research and product improvement, recommend bright, long-lasting Westinghouse Mazda Lamps for every lighting application and installation.

While much of our fluorescent production is earmarked for war industry, we are continuing as far as possible to supply fluorescent lamps for essential civilian use. Westinghouse Electric and Manufacturing Company, Bloomfield, New Jersey.

# SEE-ABILITY FROM THE LAMP

Westinghouse

PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

MAZDA LAMPS FOR SEE-ABILITY

**WESTINGHOUSE PRESENTS** JOHN CHARLES THOMAS • SUNDAY 2:30 EWT., N.B.C. • "TOP OF THE EVENING" • MON. WED. FRI. 10:15 EWT., BLUE NET.

the nation. Regardless of the fact that appliances have been out of production for some time, the membership remains as is. Three members, who have gone out of business, have dropped from the association, but in their places are three who have recently been taken in. There are 23 firms represented, with a total membership of 26.

During the current year the association has contributed to the War Chest, fund for Crippled Children, and the Red Cross. In addition, many members have taken an active part in bond sales drives and similar campaigns.

## BullDog Field Engineers Attend Detroit Clinic

New product improvements and better service in spite of wartime conditions were top-ranking considerations when BullDog Field Engineers held the second in their present series of clinics at the Wardell Sheraton Hotel, Detroit, August 7-12.

J. J. Mitchell, vice-president in charge of sales, opened the clinic with a special merchandising address, and Al Togesen, special field engineer, conducted the illustrated lectures. Estimating and engineering details concerning derating, panelboards, switchboards, Circuit Master Breakers, Vacubreak switches, Universal and Industrial Trol-E-Duct and BUStribution Duct were covered in the talks. A special feature of the clinic was a daily luncheon meeting with plant department heads to discuss means for closer coordination between factory and field personnel.

Clinic members also spent a day touring the main BullDog plant, 7610 Joseph Campau, Detroit, and watching demonstrations in the company's research laboratory.

Field engineers attended the Clinic from Cleveland, Columbus, Cincinnati, Milwaukee, Pittsburgh, New York, Chicago and Portland, Oregon.

## Southwest Distributor Appointed by Crosley

Appointment of Eads Bros. Furniture Company, of Ft. Smith, Arkansas, as distributor for The Crosley Corporation in the western Arkansas and the eastern Oklahoma territory was announced

W. M. Eads

recently by The Crosley Corporation.

The firm was founded in 1901 and its management has been in the same family for the past 43 years. W. M. Eads, president and treasurer of the company, has been head of the firm for the past 20 years. The company, whose offices are located at 410-16 Garrison Avenue, in Fort Smith, has been the distributor of furniture, floor coverings and kindred lines ever since it was established. It has been handling major household appliances since 1929.

R. A. Skinner, vice-president of the company, has been with the firm since 1901 and Allan Kennedy, secretary, has been associated with the firm since 1909.

In addition to the display rooms and offices on Garrison Avenue, the company operates an appliance warehouse and furniture warehouse and finishing plants. Complete service and parts facilities are maintained in Fort Smith by the company.

## Texas Co-ops Organize State-wide Association

A. C. Thomas, superintendent of Comanche County Electric Cooperative Association, Comanche, was elected president of the Texas Power Reserve Electric Cooperative at the recent annual meeting of the Texas statewide in Austin.

Virgil B. Shaw, superintendent of Wood County Electric Cooperative, Quitman, was elected vice president, and M. L. Cowan, superintendent of San Bernard Electric Cooperative, Bellville, secretary-treasurer. The board of directors includes H. T. Sears of Bellville, president of Grayson-Collin Electric Cooperative; Orville B. Bryan, superintendent of Cap Rock Electric Cooperative at Stanton; E. A. Hassman, superintendent of Guadalupe Valley Electric Cooperative, Cost, and Raymond Hampel, superintendent of McLennan County Electric Cooperative, McGregor.

More than 250 superintendents, directors and members of the Texas co-ops attended the two-day meetings.

## Synthetic Rubber Latex Insulation Announced

Nubun, a new synthetic rubber latex insulation for power, lighting and communication cable has been developed by United States Rubber Company, it was announced by C. W. Higbee, manager of the wire and cable department, at a luncheon at the Biltmore Hotel, August 3.

The new insulation is a result of wartime developments in rubber technology and will permit the design of new types of wire and cable with improved electrical and physical characteristics.

Made by the now famous latex continuous dip method, Nubun will have great advantages over ordinary wire where replacement and space are important factors. Fire alarm, wire and cable police communication systems as well as other highly essential telephonic systems will be more easily replaced and serviced and will have greater resistance to destructive forces which cause circuit troubles with the use of this type of wire, it was stated.

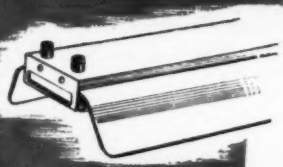
Qualities of Nubun insulation cited by Mr. Higbee, include flexibility, impermeability to water, laminated construction, and perfect centering of the conducter to produce an insulated wire of maximum conductivity and minimum diameter. The synthetic insulation is said to be exceptionally homogeneous following vulcanization and has high electrical characteristics such as di-electric strength and insulation resistance. The special synthetic rubber compound is low in specific conductive capacity, has good aging qualities because of the presence of special anti-oxidants, and will resist severe wear because by the nature of the latex process, the rubber particles are not distorted or broken down by milling.

COLD-CATHODE

# Guth Quick-Liter

TRADE MARK

*The Original Starterless Fluorescent has proved itself in gruelling tests since July 1942!*



**No Starter Switches**

Maintenance cost is lower, and the problem of checking for "dead" Starters is eliminated.

The GUTH Quick-Liter is Cold-Cathode Fluorescent Lighting. Its Cathodes start COLD . . . and QUICKLY! There is no pre-heating as is customary in the Starter-Switch type of Fluorescent.

Introduced for use in War Plants, where Starter-Switch troubles and variable line-voltage conditions prevailed, the GUTH Quick-Liter provided efficient Cold-Cathode Lighting economically — at low, safe voltages.

**Write for a valuable report on GUTH Quick-Liters in use.**

**Would Operate in an Ice Box**

GUTH Quick-Liters have been operated at as low as 0° F. 2,000 Quick-Liters are in daily use in Alaskan and Aleutian Island [illegible]

**Lights Instantly**

At the flick of the switch — there's light! No flickering, flashing, or waiting.

**Immediately Available**

Mass-production for lower cold-cathode costs. No expensive installation or maintenance costs. Anyone can [illegible] Quick-Liter Cold-Cathode!

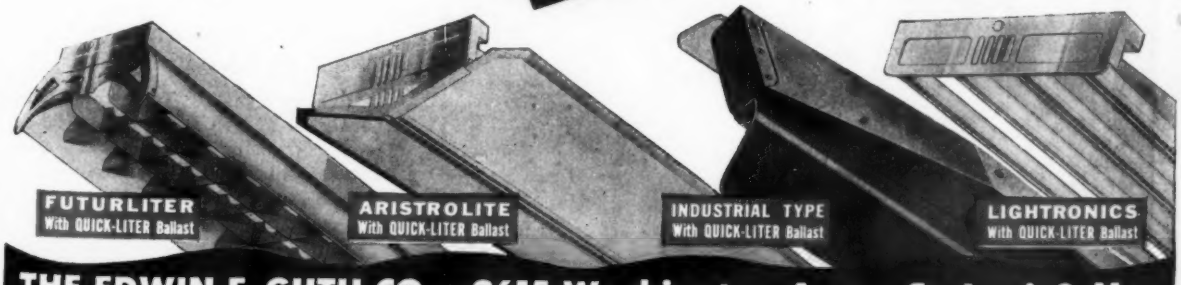
**Long Lamp Life**

GUTH Quick-Liter uses the standard General Electric 40-watt Cold-Cathode Lamp. Its efficiency in operation results in maximum lamp usage.

**Operates at Irregular or Low Voltage**

Heavy electrical loads in many plants cause low or irregular voltage. Quick-Liter starts and operates on as low as 85 Volts.

*Leaders in Lighting* **Guth** *Since 1902*




**THE EDWIN F. GUTH CO. • 2615 Washington Ave. • St. Louis 3, Mo.**

Nubun insulation is made from a special modification of Buna S synthetic rubber.

"Before the supply of natural rubber latex was curtailed," Mr. Higbee stated, "the United States Rubber Company chemists began investigating other possible insulating materials that could be applied to wire by the latex process. Of the materials then available, Buna S in the form of latex seemed to present the most likely possibilities. However, Buna S as then made was unsatisfactory for use as insulation applied by the latex dip method, particularly from the standpoint of electrical and physical characteristics. It was therefore necessary to modify and improve upon the basic Buna S polymer before it could be applied to wire in the latex form and produce an acceptable insulating material."

## NECA Selects Members For National Board

The board of directors of the North Carolina chapter of the National Electrical Contractors Association and the Southeastern Industrial chapter of the association at a joint meeting at Charlotte, N. C., July 22 confirmed the recent election of three governors by mail ballot.

Hobart M. Bryant, of High Point, N. C., will represent the North Carolina chapter on the national board, J. M. Richardson, of Roanoke, Va., will represent the Virginia chapter, and K. D. White, of Atlanta, Ga., will be the Southeastern governor.

They will be inducted at the annual meeting of the National Electrical Contractors Association at French Lick, Ind., in October.

D. B. Clayton, of Birmingham, Ala., vice president of the national association and member of the executive committee, presided over the meeting just held at Charlotte. Discussions centered on postwar problems and re-employment of men now in the armed services.

## Fixture Design Contest For Lighting Engineers

To stimulate interest in improved postwar lighting, a design competition open to anyone connected with the lighting division of a public utility has been announced by Sylvania Electric Products, Inc., of Salem, Mass. A total of $1,600 in prizes will be awarded for the best designs for a shielded commercial fixture for four 40-watt fluorescent lamps.

Designs submitted will be judged by Howard M. Sharp, president of the Illuminating Engineering Society; Allan E. Parker, physics professor, Worcester Polytechnical Institute; Lurelle Guild, product design consultant; C. A. Carpenter, electrical engineer for Graham, Anderson, Probst and White. Appearance, ease of installation, maintenance, shielding and efficiency will be the principal considerations in selecting winners.

Official entry blanks, rules and complete details are available to utility lighting people on request to Sylvania Electric Products, Inc., Boston St., Salem, Mass. Entry blanks should be postmarked not later than October 1, 1944, to cover designs submitted before December 1, 1944. Results of the competition will be announced on or before January 1, 1945.

## Lighting Promotion Mail Pieces Offered by NEMA

Three attractive direct mail promotion pieces on the subject of industrial lighting have been prepared by the Industrial and Commercial Lighting Equipment Section, of the National Electrical Manufacturers Association, and are being offered for sale to public utilities only on a no-profit basis.

The subjects of the three pieces that have just been issued are: "How to Get Increased Manpower from Existing Personnel," "Ways to Speed Up Production with Better Lighting," "Extra Help for Your Maintenance of Lighting Facilities." These promotion pieces are attractively printed in two colors and include a number of large, clear illustrations as well as explanatory diagrams. Space is provided for the utility company's name and a return card is included in each piece with the address of the utility company. All of the pieces feature free lighting engineering service.

This series of mailing pieces is the first of several which are planned by this committee. Further information may be obtained by writing National Electrical Manufacturers Association, 155 East 44th St., New York 17, N. Y.

## Raleigh Voters Approve CP&L 40-Year Franchise

Raleigh citizens recently voted nearly 10 to 1 in favor of an ordinance granting to the Carolina Power and Light Company a 40-year franchise covering electric and passenger-transportation services in Raleigh.

Exceeding the expectations of those interested in the special elec-

"Did I understand you correctly, 'Cordially yours' to OPA?"

# Still the SPEARHEAD

## in the drive for BETTER LIGHT-BETTER SIGHT

A decade ago, the WESTON Illumination Meter was the basis for the original Better Light — Better Sight campaign. Its development made possible, for the first time, the measurement of illumination efficiency in terms that were scientific, constant, and readily understood.

And today, a WESTON Illumination Meter, *but of an advanced* type, still spearheads the crusade. Equipped with the exclusive WESTON VISCOR filter it provides direct measurement of light of any type or color composition, without correction factors. Whether you measure daylight, neon, incandescent or fluorescent, you get a direct, accurate measurement with Viscor filtered WESTON Illumination Meters.

Thus in light measurement, too, WESTON's pioneering achievements are only mile-posts in an endless, upward march. The engineering skill that fathers them keeps pace with progress . . . *Keeps constantly leading the way.* Weston Electrical Instrument Corporation, 578 Frelinghuysen Avenue, Newark 5, New Jersey.

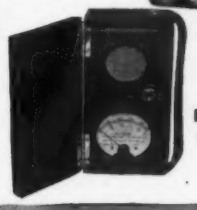
**WESTON**

***DIRECT-READING***

**Illumination Meters**

Model 703 Sightmeter — equipped with the stable WESTON VISCOR filter.

Model 603 WESTON Illumination Meter (VISCOR filtered)



Model 614 WESTON Illumination Meter (VISCOR filtered)

Laboratory Standards . . . Precision DC and AC Portables . . . Instrument Transformers . . . Sensitive Relays . . . DC, AC, and Thermo Switchboard and Panel Instruments.

# WESTON

Specialized Test Equipment . . . Light Measurement and Control Devices . . . Exposure Meters...Aircraft Instruments... Electric Tachometers...Dial Thermometers.

***FOR OVER 56 YEARS LEADERS IN ELECTRICAL MEASURING INSTRUMENTS***

THE NEW KELVINATOR
Kelvinator

# ...HOME FREEZER!

## An important new home appliance for building postwar domestic load

To those electric utilities faced with the task of building up their domestic load in the postwar years, the new Kelvinator Home Freezer is good news.

There are three important reasons why the new Kelvinator Home Freezer can be depended upon to produce retail sales in volume and increase domestic load:

FIRST—a Home Freezer built by a company with more than *30 years of experience* in the precision building of *low temperature* refrigeration units.

Kelvinator is the oldest manufacturer of cabinets designed specifically for the storage of ice cream and food products at low temperatures.

SECOND—a Home Freezer whose refrigeration power unit—the famed Kelvinator Polarsphere—has a *proven record of trouble-free operation* unmatched by any in the industry.

It is a record established in ice cream cabinets, beverage coolers, household refrigeration and commercial refrigerating units . . . first requisites of which are day-in, day-out uninterrupted performance.

THIRD—a name which has been synonymous with finest of dependable refrigeration in American homes for three decades.

It is a name which will produce *immediate public acceptance* for this great new Kelvinator product.

Plans for getting the new Kelvinator Home Freezers into homes and on utility power lines as quickly as possible after the war are well developed. They are a part of Kelvinator's long-range merchandising plan to get Kelvinator Refrigerators, Electric Ranges, Home Freezers and Electric Water Heaters into use where they will do their part in helping utilities increase their domestic load.

LOOK AHEAD WITH KELVINATOR

DIVISION OF NASH-KELVINATOR CORPORATION

Kenosha • Milwaukee • DETROIT • Grand Rapids • Lansing

*Awarded to Nash-Kelvinator Corporation, Propeller Division*

tion, the total vote cast was recorded unofficially at 3,051. The unofficial returns listed 2,773 votes in favor of the ordinance and only 278 against it. The average vote in a Raleigh municipal election is about 8,000.

"We are most gratified at the results of the election. We greatly appreciate such an expression of confidence on the part of the people of Raleigh," commented L. V. Sutton, president and general manager of CP&L.

One provision of the ordinance is that, in the event the franchise becomes effective, the CP&L Company will surrender and forever relinquish to the city all rights, title, interest an destate under a franchise covering electric service granted by the city on December 5, 1890, to S. W. Jacobs for an unlimited period.

The CP&L Company, since 1908, has furnished electric and passenger transportation services under the Jacobs franchise and under a franchise covering both electric and passenger transportation services, granted by the City of Raleigh to the Raleigh Electric Company on May 24, 1905, for a term of 40 years that expires on May 24, 1945.

The city will receive no remuneration from the CP&L Company. No fixed rates are established, as they are set each year by the State Utilities Commission.

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### Schanuel Named Secretary Indoor Climate Institute

Arthur E. Schanuel has been appointed executive secretary of the Indoor Climate Institute, effective as of July 1, according to an announcement by P. B. Zimmerman, president of the organization. For the past six years Mr. Schanuel has been associated with the National Electrical Manufacturers Association as field representative of the National Adequate Wiring Bureau. He has a wide acquaintanceship in the residential branch of the electrical industry and the home building field.

"With the appointment of Mr. Schanuel, the ICI rounds out its first year with a complete program of organization and the establishment of policies which should give great scope, of far-reaching value to the Institute's operations," stated Mr. Zimmerman.

In this connection, ICI has just

**Arthur E. Schanuel, recently named executive secretary of Indoor Climate Institute.**

issued a Progress Report to its members, supplemented by a Question and Answer Bulletin which clarifies the manner in which ICI will function under a committee form of structure.

"Since the formation of the Indoor Climate Institute a year ago; the public, press, trade associations, manufacturers of heating, cooling, and air conditioning equipment, building and insulation materials, producers of fuel and the utilities have indicated a deep-rooted interest in the subject of indoor climate and its effect upon people — wherever they work or live," continued Mr. Zimmerman.

Over fifty leading American firms compose the active membership of ICI. An associate membership was authorized at a recent board meeting. It will permit building material, fuel, insurance and banking interests to participate in the educational program with the American public.

## Government News and Views For the Electrical Industry

### Limited Appliance Production Permitted

Production of electrical appliances, with the exception of electrical refrigerators and washing machines, and a number of other household items will be authorized by the War Production Board where manufacturers can obtain the necessary materials and manpower without interferring with war production or other essential civilian production.

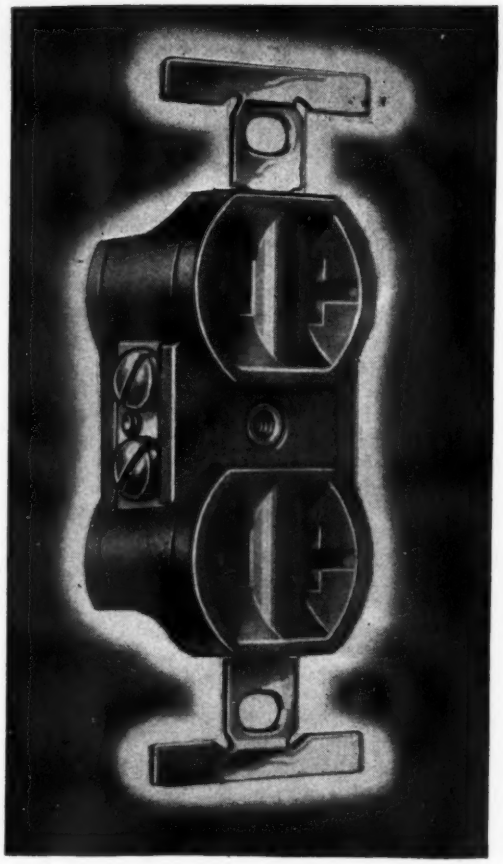
Designated as the "spot authorization" procedure, the new regulations established by Priorities Regulation No. 25 provides a method for authorizing civilian production through field offices of the War Production Board, when labor, facilities and materials are available and are no longer needed for war or essential civilian production.

It is aimed at preventing unemployment and the idleness of facilities which might result from termination or reduction of war contracts. It is also designed to assist the movement and use of idle and excess material inventories.

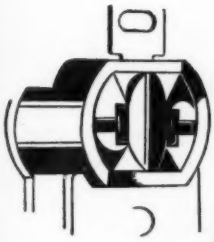
Following the issuance of Priorities Regulation No. 25, on August 15, twenty-nine limitation orders governing the production of consumers durable products have been amended to permit the "spot authorization" procedure.

The orders that have been amended, together with the products which they cover, are:

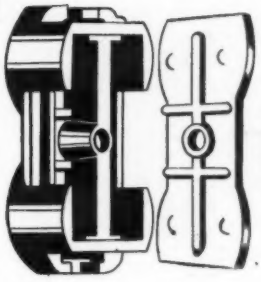
Domestic laundry equipment (L-6); umbrella frames (L-36); wood case and other non-mechanical pencils and pen holders (L-227-b); pen nibs (L-227-a); flatware and hollow ware (L-140-b); metal hair pins and metal bob pins (L-104); dry cell batteries and portable electric lights operated by dry cell batteries (L-71); golf clubs (L-93); bicycles and bicycle parts (L-52); cast iron ware (L-30-c); enameled ware (L-30-b); galvanized ware and non-metal coated metal articles (L-30-a); domestic electric ranges (L-23-b); vending machines: merchandise (L-27); lawn mowers (L-67); domestic vacuum cleaners (L-18-b); domestic ice refrigerators (L-7-c); miscellaneous cooking utensils and other articles (L-30-d); electrical appliances (L-65); electric irons (L-65-a); photographic and projection equipment, accessories and parts (L-267); fountain pens and mechanical pencils (L-227); metal household furniture (L-62); musi-



# DUPLEX RECEPTACLE
## built for service



**EASY-TO-FIND SLOTS** for effortless insertion of double "T," parallel, tandem or polarized-bladed plug caps.



**HEAVY-MOLDED BAKELITE** body and back plate, strong and moisture proof; completely enclosed and insulated current-carrying parts.

**EXTRA-HEAVY TERMINALS** and contacts. Spring contacts of special alloy firmly grip both sides of plug cap blades. Will accommodate No. 10 wire.

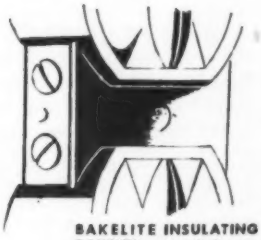
**RIGIDLY-NESTED YOKE,** securely anchored to entire unit. Plaster ears easily removed if not required.

It pays to put in strong and enduring units like this Bryant duplex receptacle.

Quality materials, correct design and rugged construction make it a safe, long-service device.

Note the outstanding features illustrated and described at right.

*Specify Bryant devices from your electrical wholesaler*



**BAKELITE INSULATING BARRIER,** extended over wiring cavity, provides separation from materials on which mounted.

BRYANT
SUPERIOR WIRING DEVICES

**THE BRYANT ELECTRIC COMPANY**
**BRIDGEPORT, CONNECTICUT**

NEW YORK • CHICAGO • SAN FRANCISCO • LOS ANGELES

cal instruments (L-37-a); beds, bed springs, mattresses and dual sleeping equipment (L-49); portable electric lamps and shades (L-33); church goods (L-136); alarm clocks (L-275); and domestic and commercial electric fans (L-176).

Persons may apply for "spot authorization" to produce these products whether they have or have not previously produced the particular product they desire to make. Applications should be filed with the WPB field office nearest to the plant in which the proposed production will be undertaken.

In announcing the new regulation, Donald M. Nelson, WPB chairman, warned that "for the time being, it is not anticipated that any large increases in production of civilian goods will be possible." The order does give assurance, however, that a large number of manufacturers will be prepared to begin production of these civilian items at the earliest moment possible. A trickle of new goods should reach the market as a result of partly fabricated materials that have been frozen in inventories.

## Outlook for Light Trucks Replacements is Gloomy

The Office of Defense Transportation has notified its 142 district offices scattered throughout the nation not to accept new applications for light motor trucks, after denial by the War Production Board of ODT's request for resumption of light truck production beginning with the first quarter of 1945.

There is little likelihood for new light motor trucks being available for the nation's truck operators during the first quarter of 1945 as a result of this action on the request of ODT for a minimum program of light trucks for essential civilian needs ODT said.

In view of the extreme tightness of flat rolled steel products and the existing manpower shortages that are affecting the medium and heavy truck program as well as other highly urgent military programs, the WPB Requirements Committee did not feel that it would be feasible to authorize the production of light trucks unless facilities and manpower were made available by cut-backs in these other urgent programs ODT was advised.

A total of 41,000 light trucks for the first quarter of next year was, however, authorized by WPB on a "suspended AA-3" basis. This, ODT emphasized, does not constitute an authorization to produce until specifically validated by WPB at some later date. It permits planning for production, but not actually production.

* * *

Authorization to produce 5,638 domestic electric ranges in the fourth quarter of 1944 has been granted to three manufacturers who are able to make them without interfering with war production, the War Production Board has announced.

The manufacturers are Frigidaire Division, General Motors Corp., Dayton, Ohio, 2,344; Gibson Refrigerator Co., Greenville, Mich., 2,500; and A. J. Lindemann and Hoverson, Milwaukee, Wisc., 794.

These manufacturers are the first ones authorized to make ranges in the fourth quarter. One company, Frigidaire Division, General Motors Corporation, had previously been authorized to make 782 ranges in the third quarter. Two other manufacturers, A. B. Stoves, Inc., Battle Creek, Mich., and the Malleable Iron Range Co., Beaver Dam, Wisc., were recently authorized to produce 9,000 and 3,000 ranges, respectively, in the third quarter.

All the electric ranges assigned for production in this order will be standard four-burner models. Since ranges of this type have not been made for about two years, and equipment will have to be made ready for operation, production will be delayed, it was explained. Manufacturers will also encounter some delay in obtaining delivery of sheet metal and other materials and components, WPB said.

None of the four-burner ranges will be available in stores until late this year. Most of them will not be on sale until the beginning of 1945. They will be available only for essential civilian replacement purposes.

* * *

Mechanics' hand service tools will not be available to the general public, above present flow levels in consumer channels, until requirements of the armed services are satisfied, the Tools Division of the War Production Board announced in releasing figures on shipments and new and unfilled orders for the first half of 1944.

Mechanics' hand service tools include pliers, wrenches, ball peen hammers, screwdrivers, etc. Woodworking tools, edge tools, and such heavy-forged tools as picks, sledges, crowbars, etc., are excluded from the list of hand service tools, the division pointed out.

* * *

Rules governing the placement of purchase orders for certain types of transformers smaller than 250 kva (kilovolt-amperes) have been modified, the Office of War Utilities, War Production Board, has announced.

It is no longer necessary to file applications for authority to purchase transformers of this size and type, except liquid-filled and dry-type power or distribution transformers smaller than 250 kva having special features, design characteristics or accessories as defined in paragraph "a" of Block 4 of the instructions on Form WPB-2643.

In general, it will not be necessary to file applications for the purchase of three-phase transformers with non-standard voltages in the smaller sizes, OWU officials said.

However, applications must be filed for all transformers 250 kva and larger, officials added.

* * *

Production of parts for domestic laundry equipment and domestic sewing machines for repair and replacement purposes is expected to be increased as a result of the relaxation of limitations on manufacturers' inventories of such parts, the War Production Board has announced.

Vacuum cleaner parts for repair purposes have been placed under the same inventory restrictions as have laundry equipment and sewing machine parts. Production of vacuum cleaner parts is expected to remain at about the present level.

Each manufacturer of parts for the repair of domestic laundry equipment, sewing machines, or vacuum cleaners may have in inventory at any one time twice as many of each type of part as he sold during the second preceding quarter.

The name "U.S. ROYAL" has long been reserved by this Company for rubber products of exceptional quality.

U.S. Royal Cords and Cables, as an example, have been known for many years for their balanced construction, flexibility, dielectric strength, smoothness of finish and physical toughness.

Now comes a new development in rubber technology, greatly speeded by critical war-time needs... a new insulation material, "Safety-Tested" for every desired quality. This has been successfully embodied in the new line of U.S. ROYAL CORDS and CABLES... a line that offers to the electrical industry the assurance of long, economical, trouble-free service... a line truly worthy of the name "Royal".

*Serving through Science*

*Listen to the Philharmonic-Symphony program over the CBS network Sunday afternoon, 3:00 to 4:30 E.W.T. Carl Van Doren and a guest star present an interlude of historical significance.*

# UNITED STATES RUBBER COMPANY

1230 SIXTH AVENUE • ROCKEFELLER CENTER • NEW YORK 20, N. Y.

# PERSONAL NOTES
## About Men You Know

**G. Edward Pendray,** assistant to president of the Westinghouse Electric and Manufacturing Company, has announced the appointment of **Richard C. Carr** as manager of institutional advertising.

Mr. Carr will be responsible for the company's institutional copy, the commercials for the Westinghouse radio programs, the Public Relations Production Department and for other printed advertising matter.

Mr. Carr joined the Westinghouse Company in October, 1943, coming from the Libby-Owens-Ford Glass Company where he was manager of the war housing division. Previously he was a contact and general agency man for the Sun Advertising Company and sales and advertising manager of the Hixon-Peterson Lumber Company. He was graduated from Yale University in 1924 with the degree of bachelor of science.

* * *

**Frank Freimann,** executive vice president of the Magnavox Company, has announced the appointment of **George H. (Rock) Smith** as sales manager of the radio-phonograph division.

Mr. Smith brings to Magnavox 20 years' experience and achievement in sales and merchandising. He was connected with the Edison General Electric Appliance Company, of Chicago, for the past 8 years, as general merchandising manager and later as general sales manager. Mr. Smith will operate from the home office in Fort Wayne, Ind.

In his new position, Mr. Smith will direct the Magnavox postwar sales plans, which, in addition to merchandising the new line of Magnavox instruments, includes a scientifically designed sales and service training course for dealers and salesmen.

Mr. Freimann pointed out that under the new sales manager's direction, Magnavox will adhere to its pre-war sales policy of merchandising radio-phonographs only as musical instruments and fine pieces of furniture through carefully selected dealers.

* * *

**Roy N. Fowler** has been named southwestern district manager for the General Electric Company's Electronics Department, **A. A. Brandt,** general sales manager of the department, has announced. Mr. Fowler's headquarters will be at the G.E. district office at Dallas, Texas.

**Roy N. Fowler**

In his new capacity, Mr. Fowler will be responsible for the sale of all products of the department in his district, which comprises the states of Arkansas, New Mexico, Oklahoma and Texas. Before his new appointment, Mr. Fowler was district advertising and sales promotion manager at Atlanta for the G.E. Apparatus Department.

Born in Maryville, Tennessee, Mr. Fowler is a graduate of Maryville College and the Louisville College of Pharmacy. He had his own radio and appliance store in Knoxville, Tennessee, from 1927 to 1931, then became manager of the electric department of Proffitts Department Store, Maryville and Knoxville, Tennessee, from 1931 to 1936. He joined the General Electric Supply Corporation as an appliance sales counseler in 1937, covering eastern Tennessee.

In 1940, he transferred to the G.E. Appliance and Merchandise Department as southeastern district refrigerator representative, with headquarters at Atlanta. In the spring of 1942, he was named district advertising and sales promotion manager for the G.E. Apparatus Department, at Atlanta, which position he held until his present appointment.

* * *

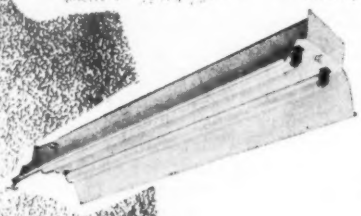
Two important sales organization changes at Easy Washing Machine Corporation were revealed last week by **W. H. Reeve,** general sales manager, with the announcement that **Bernard L. Finn,** advertising manager, had resigned to join the advertising staff of Life magazine; and **Richard E. Weiss** had been named Easy's new advertising manager.

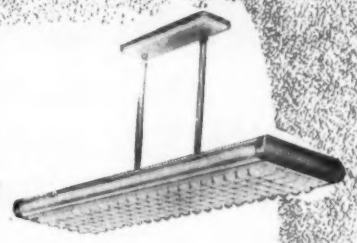
Prior to joining Easy Washer in November 1939 as assistant advertising maanger, Mr. Weiss held the position of advertising manager for Samson-United Corp., manufacturers of electrical appliances in Rochester. Before that he was associated with Hearst's Rochester Journal and Sunday American as promotion manager.

Since Pearl Harbor, Mr. Weiss has been active in Easy's industrial and public relations pro-

**G. H. Smith**

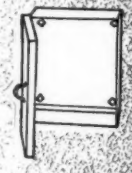
**R. E. Weiss**





# The SPERO JOBBER POLICY

## is your cue to Postwar Planning

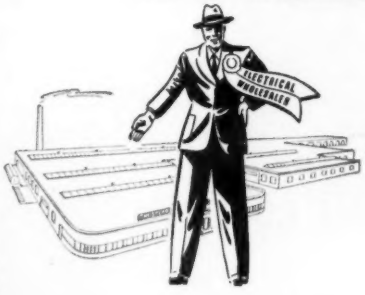


**If you are planning now to get your share of the tremendous lighting business after the war, Spero products offer you many advantages. No need to waste time and money "shopping around" — Spero offers you five complete lines of high quality products, *priced right,* from one reliable source. These are made available through electrical wholesalers — assuring quick service and prompt deliveries.**

**In fluorescent fixtures, jobbers can assure their customers a complete line for every industrial and commercial need — incorporating the latest improvements in engineering and design. Spero pioneered instantaneous starting — which we predict will find almost universal application in postwar lighting — and today Spero INSTA-LITE has already been field-tested by thousands of successful installations.**

**Other Spero products include reflectors, electrical construction materials, floodlights and vapor-proof units — in complete range of types and sizes for every installation — large or small.**

## *In Wartime as in Peacetime*




### THE SPERO PLANT STANDS BEHIND THE ELECTRIC WHOLESALER

**Despite material shortages, manpower losses and government limitations, we have continued to make and supply to wholesalers our five lines of products —as nearly complete as possible. There will be no reconversion delay at Spero because our line in peacetime consists of the same items as used in wartime. So we say *look to Spero for immediate and postwar electrical needs.***

**THE SPERO ELECTRIC CORPORATION**

**18222 LANKEN AVE. ★ CLEVELAND, OHIO**

IMPERIAL NEOPRENE JACKETED PORTABLE CABLES

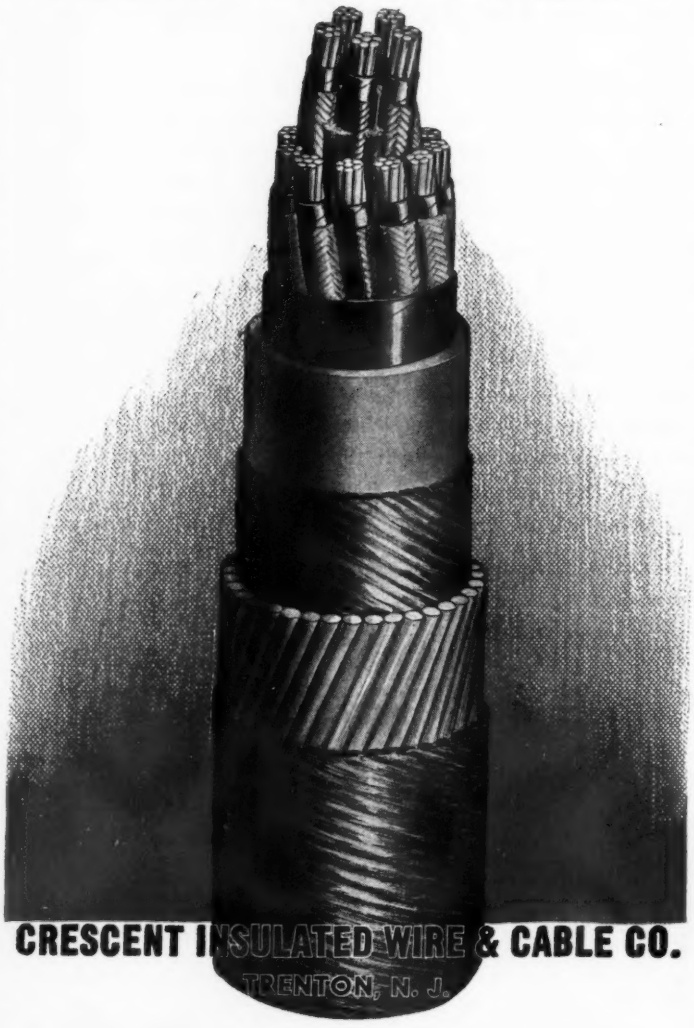
# CRESCENT

*Ability to Manufacture*

**WIRES and CABLES**

*is the Result of*

*OVER FIFTY YEARS EXPERIENCE*



**CRESCENT INSULATED WIRE & CABLE CO.**

TRENTON, N. J.

# CRESCENT

WIRE and CABLE

NEMA

BUILDING WIRE ● SERVICE ENTRANCE CABLE ● CRESFLEX NON-METALLIC SHEATHED CABLE ● ARMORED CABLE

PERMACORD ● LEAD-ENCASED AND PARKWAY CABLES ● SYNTHOL WIRES ● WELDING CABLES ● SHIPBOARD CABLES

RUBBER POWER CABLES ● VARNISHED CAMBRIC CABLES

grams as well as promoting war worker recruitment campaigns. In addition he has served as a member of Easy's post-war sales planning group.

* * *

**Lieut. Col. Boyd Bullock** has returned from Army service to take over his prewar position as advertising manager of General Electric's appliance and merchandise department. He entered active Army service February 12, 1942, as a major. At that time he reported at the Infantry School, Ft. Benning, Ga., where he attended the Battalion Commanders and Staff Officers Refresher course. Later he became an instructor in tactics there. At the time of his discharge he was commanding officer of officers' school at Camp Custer, Mich.

His service record of over 20 years with General Electric Company started in the publicity department at Schenectady, where his first assignment was market research and analysis. Then came a three-year dealer promotional job dealing with the increasingly serious problem of distributing catalogs, handbooks, sales aids, direct mail, and similar publicity material.

He was then placed in charge of the company's institutional advertising program, and in 1930 was appointed division manager responsible for advertising products sold to electric service companies. In 1933 he was appointed assistant to the manager of the publicity department, and shortly afterward assistant manager. In 1939 he was appointed advertising manager of the appliance and merchandise department at Bridgeport.

**Boyd W. Bullock**

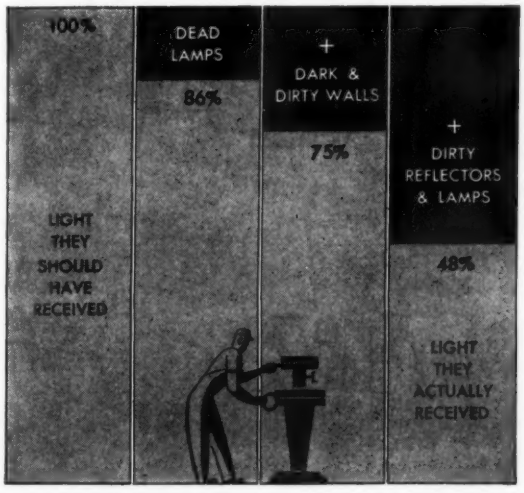
# Fluorescent operating hints

**No. 3** of a series published by SYLVANIA for all users of fluorescent lighting

## HOW TO GET THE LIGHT YOU PAY FOR

Observing a few simple operating rules can prevent waste of as much as 50 per cent of the fluorescent light you buy.

For example, here is the waste caused by improper maintenance in one typical plant:




Dead lamps left in fixtures rob this plant of 14% of the light that is being paid for—dark and dirty walls, of 11% more—dirty reflectors and lamps, of 27% more. Why get only half of the light that simple maintenance will bring you?

## SCHEDULING MAINTENANCE SAVES DOLLARS IN LIGHT

Schedule regular checking and cleaning. All you need is a lightmeter.

Whenever the meter shows that you are receiving 25% less light than you should—it's time to check for dead lamps, and to get out the soap and water.

Attend to dead lamps first. Unless they are cut out of the circuit, they tend to overheat ballasts, wear out your starters, and waste electricity. But before you discard lamps, be sure the fault is not in the starters, ballasts, or circuit.

## "TWO-MAN TEAM" MAINTENANCE METHOD

All you need to insure clean lamps and reflectors is plenty of soap and water—plus a *regular* maintenance schedule. The following two-man method has been proved very successful.

**1.** Two-man team begins work with one clean reflector previously removed from a fixture near the end of the cleaning route.

**2.** At first fixture on the route, man on ladder removes lamps and reflector, hands them down to man on floor in exchange for previously cleaned reflector. Ladder man then cleans housing, side panels, etc.

**3.** Ladder man secures clean reflector in place. (No hand tools are required with Captive Latches on Sylvania Industrial Fixtures). Man on floor wipes off the lamps and passes them back to ladder man.

**4.** Ladder man, with supply of Sylvania Starters, reinstalls cleaned lamps and sees that fixture is working properly.

**5.** Ladder man descends and puts ladder in place at next fixture. Meanwhile, man on floor washes and dries the first fixture and has it ready to replace soiled reflector in the next fixture.

*Follow this procedure through entire installation.*

## HOW OFTEN?

Frequency of cleaning depends upon the location of installation and the type of work it lights. Air-filtered and air-conditioned rooms may require fixture cleaning only once in six months. But cleaning may be necessary every few weeks in a factory where the atmosphere is heavy with dust and oil. Be guided by your lightmeter in scheduling cleaning.

*For Additional Maintenance Information*

**Send for this Free Booklet—**

*100,000 already distributed*

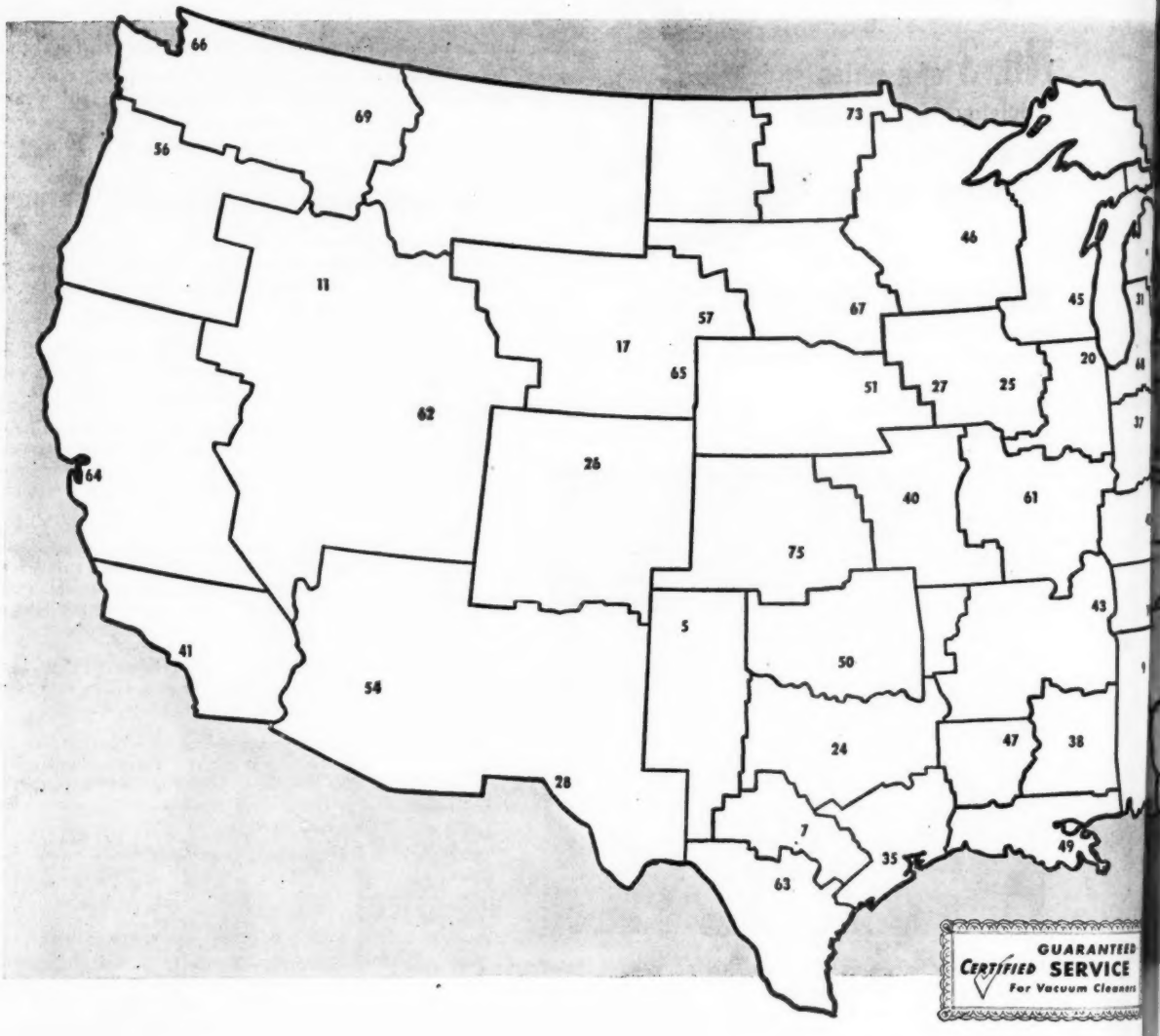
# SYLVANIA ELECTRIC PRODUCTS INC.

*"Fluorescent at its Finest"*

SALEM, MASSACHUSETTS

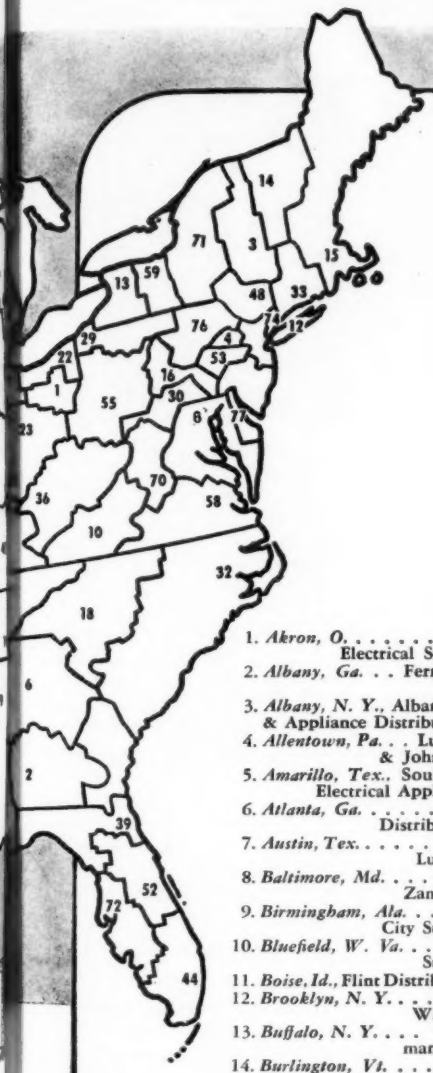
FLUORESCENT LAMPS, FIXTURES AND ACCESSORIES, INCANDESCENT LAMPS, RADIO TUBES, CATHODE RAY TUBES, ELECTRONIC DEVICES

# Premier's Distributors




HERE THEY ARE—the finest group of specialty appliance distributors in America—Premier's distributors! When Premier production is resumed, these organizations will be ready and waiting to give dealers quick and effective aid in the switchback to sales of new vacuum cleaners—they've been carefully selected both for their geographical locations and for their ability to give maximum service. Don't delay until too late—get in touch at once with *your* Premier distributor and get started mapping out your plans for the future!

# Cover the Map!



1. *Akron, O.* . . . . . Sacks Electrical Supply Co.
2. *Albany, Ga.* . . Ferrell-Wight Co., Inc.
3. *Albany, N. Y.*, Albany Garage & Appliance Distributors, Inc.
4. *Allentown, Pa.* . . Luckenbach & Johnson, Inc.
5. *Amarillo, Tex.*, Southwestern Electrical Appliance Co.
6. *Atlanta, Ga.* . . . . . Brown Distributing Co.
7. *Austin, Tex.* . . . . . Calcasieu Lumber Co.
8. *Baltimore, Md.* . . . . Jos. M. Zamoiski Co.
9. *Birmingham, Ala.* . . . . Steel City Supply Co.
10. *Bluefield, W. Va.* . . Bluefield Supply Co.
11. *Boise, Id.*, Flint Distributing Co.
12. *Brooklyn, N. Y.* . . . . . E. A. Wildermuth
13. *Buffalo, N. Y.* . . . W. Bergman Co., Inc.
14. *Burlington, Vt.* . . . Vermont Appliance Co.
15. *Cambridge, Mass.* . . . . The Eastern Co.
16. *Camp Hill, Pa.* . . . . Penn Appliance Distributors
17. *Casper, Wyo.*, Casper Supply Co.
18. *Charlotte, N.C.*, Williamson, Inc.
19. *Chattanooga, Tenn.* . . Harry W. Cameron, Inc.
20. *Chicago, Ill.*, H. U. Mann Co.
21. *Cincinnati, O.* . . . . . Ohio Appliances, Inc.
22. *Cleveland, O.* . . . . Midland Electric Co.
23. *Columbus, O.* . . . . . Ohio Appliances, Inc.
24. *Dallas, Tex.* . . . Radio City Distributing Co.
25. *Davenport, Ia.* . . . . . A. A. Schneiderhahn Co.
26. *Denver, Col.* . . . . . Radio & Appliance Distributing Co.
27. *Des Moines, Ia.* . . . . . A. A. Schneiderhahn Co.
28. *El Paso, Tex.*, W. J. Walz Co.
29. *Erie, Pa.* . . . . . Young Bros.
73. *Fargo, N. D.*, The Larson Co.
30. *Gettysburg, Pa.* . . . . . M. A. Hartley & Co.
31. *Grand Rapids, Mich.*, Radio Equipment Co.
32. *Greenville, N. C.* . . Carolina Sales Corp.
33. *Hartford, Conn.* . . . Wood-Alexander & Co.
34. *Honolulu, Hawaii*, Williams Equipment Co., Ltd.
35. *Houston, Tex.* . . . . Straus-Bodenheimer Co.
36. *Huntington, W. Va.* . . . Van Zandt Supply Co.
37. *Indianapolis, Ind.* . . . Radio Equipment Co., Inc.
38. *Jackson, Miss.*, Cabell Electric Co.
39. *Jacksonville, Fla.*, Southern Hardware & Bicycle Co.
40. *Kansas City, Mo.* . . . Jenkins
41. *Los Angeles, Cal.*, Listenwalter & Gough
42. *Louisville, Ky.* . . . . Peaslee-Gaulbert Corp.
43. *Memphis, Tenn.* . . . . . McGregor's Inc.
44. *Miami, Fla.* . . . . McDonald Electric Co., Inc.
45. *Milwaukee, Wis.* . . . . Roth Appliance Distributors, Inc.
46. *Minneapolis, Minn.* . . . The Roycraft Co.
47. *Monroe, La.* . . . . . United Electric Service Co.
*Newark, N. J.*, L. R. Beavis & Co.
48. *Newburgh, N. Y.* . . . Shapiro Sporting Goods Co.
49. *New Orleans, La.* . . . Walther Bros. Co.
50. *Oklahoma City, Okla.*, Hales-Mullaly Co.
51. *Omaha, Neb.* . . . . Sidles Co.
52. *Orlando, Fla.* . . . Robertson Supply Co.
53. *Philadelphia, Pa.* . . . Elliott-Lewis Electrical Co., Inc.
54. *Phoenix, Ariz.*, W. G. Walz Co.
55. *Pittsburgh, Pa.* . . . . Electric Products, Inc.
56. *Portland, Ore.* . . . . . Sunset Electric Co.
57. *Rapid City, S. D.* . . . Casper Supply Co.
58. *Richmond, Va.*, Commonwealth Sales Corp.
59. *Rochester, N. Y.*, O'Donnell-Dunigan Co.
60. *Saginaw, Mich.* . . Northern Supply Co.
61. *St. Louis, Mo.* . . . Interstate Supply Co.
62. *Salt Lake City, Ut.* . . . Flint Distributing Co.
63. *San Antonio, Tex.* . . Southern Equipment Co.
64. *San Francisco, Cal.* . . . H. R. Basford Co.
65. *Scottsbluff, Neb.* . . . Casper Supply Co.
66. *Seattle, Wash.*, Sunset Electric Co.
67. *Sioux Falls, S. D.* . . . . E. J. Gustafson Co.
68. *South Bend, Ind.* . . . Radio Equipment Co., Inc.
69. *Spokane, Wash.* . . . . Sunset Electric Co.
70. *Staunton, Va.* . . . . . M. A. Hartley & Co.
71. *Syracuse, N. Y.* . . . . . E. M. O'Donnell Co.
72. *Tampa, Fla.*, Electric Supply Co.
73. *Thief River Falls, Minn.* . . . The Larson Co.
74. *White Plains, N. Y.*, Behrer-Nason Co.
75. *Wichita, Kan.*, The Steve Wise Co.
76. *Wilkes-Barre, Pa.*, R. B. Wall Co.
77. *Wilmington, Del.* . . Garrett-Miller & Co.

**PREMIER**

**DIVISION**

**ELECTRIC VACUUM CLEANER CO., INC.**

**CLEVELAND 10, OHIO**

The appointment of **E. Wayne Converse** as advertising manager of Electromaster, Inc., Detroit, manufacturer of domestic and heavy duty electric ranges and water heaters, is announced by **Gerald Hulett,** vice president in charge of sales.

**E. W. Converse**

The appointment is coincident with Electromaster's plan to enlarge its scope of advertising and sales promotional activities as a part of its broad postwar policy. Mr. Converse has also been made responsible for promotional work.

Mr. Converse brings to Electromaster many years of experience in the publishing and advertising business. Previously associated with daily newspapers, he conducted his own advertising and publishing business for a number of years before the war. More recently, he has been in war work with Fisher Body Division of General Motors.

* * *

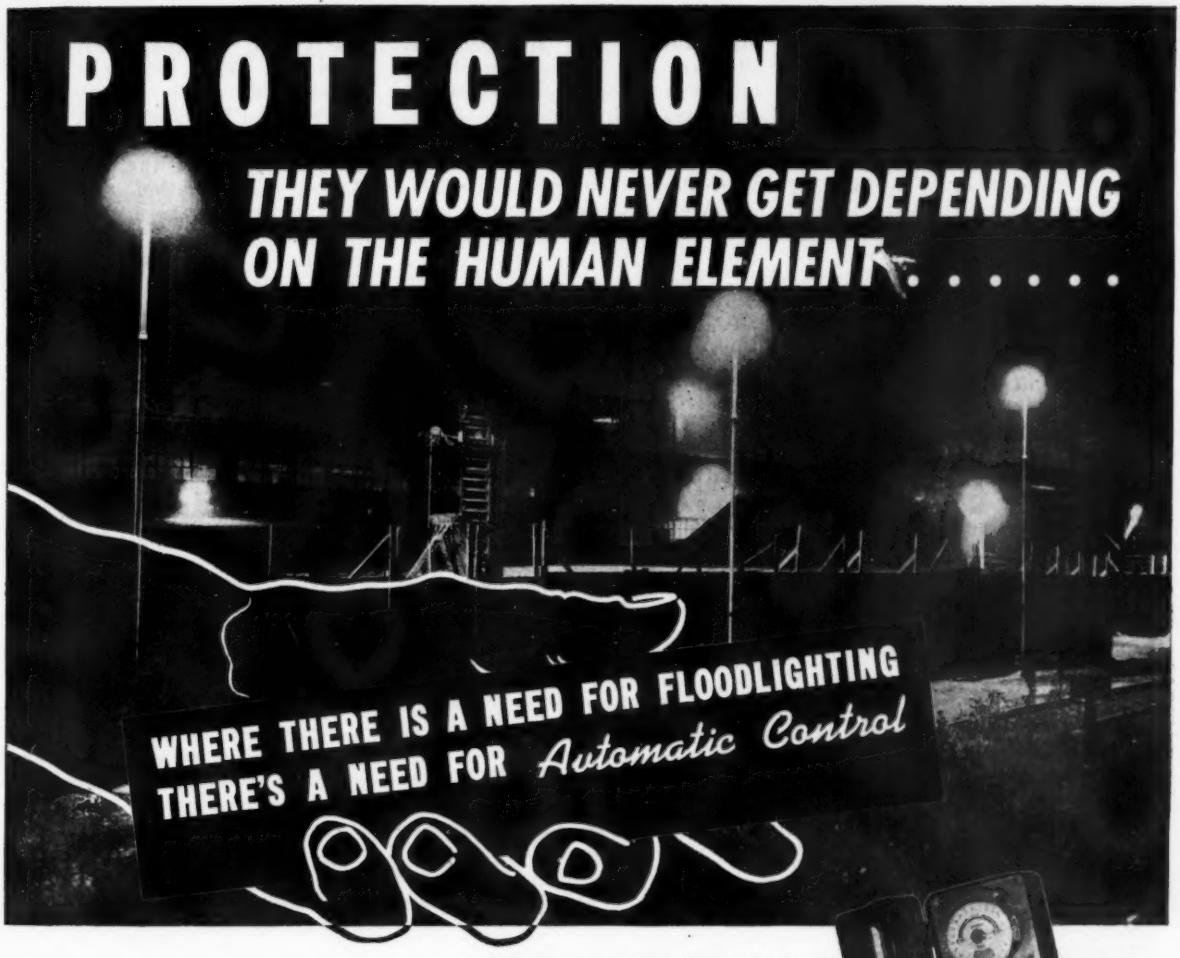
Announcement of the election of **R. M. Oliver** as vice president in charge of sales of the Proctor Electric Company has been made by **T. W. Allen**, chairman of the company's board of directors. Mr. Oliver will direct all sales and advertising activities of the electrical appliance manufacturing firm. He has been serving as assistant general sales manager.

Known as the "daddy" of the famed Proctor Swap Plan, Mr. Oliver originated this idea which has resulted in the sale of more than $10,000,000 in War Savings Stamps. The plan calls for turning in idle electrical appliances in return for stamps.

Mr. Oliver has been associated with the industry since 1927. His first position was with Bozell and Jacobs, Inc., an advertising agen-

# PROTECTION

## THEY WOULD NEVER GET DEPENDING ON THE HUMAN ELEMENT . . . . . .




• *Write for catalog that describes all types—tells about ease of installation, range of application, and dependable construction.*

YOUR customers buy floodlighting for protection. In each case there are the "on" and "off" times to consider. You can sell this accuracy of regulation by recommending SANGAMO TIME SWITCHES. Then all dependence on the human element is eliminated. Then the floodlights give full and complete protection — they are never on too late or off too early. Get these time switch sales now from new installations and from those made previously.

## SANGAMO TIME SWITCHES

• There are types to meet every protective lighting control need. The complete line includes Astronomic Dial, Synchronous Carry-Over, and Outdoor Time Switches. Form VSW2 Astronomic Dial Time Switch is shown above. Current interruptions up to 10 hours will not stop it nor affect its "on" and "off" settings.

ARMY E NAVY

**SANGAMO ELECTRIC COMPANY** SPRINGFIELD ILLINOIS

cy of Omaha. Here he handled merchandising advertising for the Nebraska Power Company. In 1929, Mr. Oliver was appointed advertising director of the Iowa-Nebraska Light and Power Co., of Lincoln, Nebraska. Five years later he advanced to the post of sales manager of traffic appliances for the same company. He won national recognition for his splendid iron and small appliance campaigns.

In 1937 he became section advertising and sales promotion manager of the Westinghouse Electrical and Manufacturing Co. of Mansfield, Ohio. In 1939, he was placed in charge of a full line advertising program for Westinghouse and in addition to his other activities also supervised laundry equipment advertising campaigns.

From 1938 to 1940 he was chairman of the Modern Kitchen Bureau electric roaster plan committee and in 1940 he accepted the position of account executive of the Proctor Electric Company's advertising agency. Two years later he was named assistant to the vice president in charge of sales.

* * *

**Carl Christiansen** has been appointed to the engineering staff of the John C. Dolph Company, Newark, New Jersey. He was formerly in charge of electrical construction for the Pan-American Airways in the South Pacific. Previous to this, he was associated with Curtiss-Wright Corporation—Electrical Division, and International Motor Company.

* * *

**Wayne A. Darden** was named general sales manager of the Oklahoma Gas & Electric Company recently to succeed the late **A. A. Brown.** Dr. Darden has been assistant sales manager since 1929 and a member of OG&E since 1925.

A native of Texas, he attended Allen Military Academy, Bryan, Texas, and was graduated from Pratt Institute, Brooklyn, N. Y., with a degree in electrical engineering. Returning to Texas, he became associated with the Central Texas Ice and Light Company. He served in World War I as an engineer officer on a destroyer and in 1921 joined the Texas Power & Light Company, at Dallas. In 1925, he became associated with OG&E as an engineer in the commercial department.

**W. H. Stueve**, a member of the organization for approximately 19 years and formerly in charge of power sales to the petroleum industry, will assume the duties of assistant general sales manager and chief power consultant. **T. E. Graham,** formerly power sales engineer, has been named manager of power sales, and **A. E. Warner,** formerly lighting engineer, has been named manager of lighting sales activities. Other changes in the sales department included the following new designations: **Roy E. Hayman,** manager of Rural Electrification; **Don H. Anderson,** manager of Commercial Sales Development; **B. C. Spencer,** manager of Commercial Cooking Sales; and **F. W. Wilson,** manager of Residential Sales.

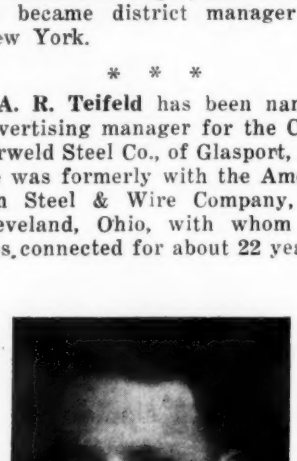
* * *

**R. H. Olson,** who has been manager of the New York district office of Electric Machinery Mfg. Company, has been appointed to the position of vice president in charge of sales, with headquarters at the company's home office in Minneapolis.

Mr. Olson began his E-M sales career in 1919, after graduation from the University of Minnesota, at the Minneapolis district office. In 1925 he went to St. Louis as district manager, and in 1930 he became district manager at New York.

* * *

**A. R. Teifeld** has been named advertising manager for the Copperweld Steel Co., of Glasport, Pa. He was formerly with the American Steel & Wire Company, of Cleveland, Ohio, with whom he was connected for about 22 years.



**A. R. Teifeld**

His last assignment covered the supervision of that company's Electrical, Wire Rope and Construction Materials Advertising.

While in Cleveland, Mr. Teifeld was affiliated with the Cleveland Advertising Club, the American Marketers Association and the Industrial Marketers of Cleveland, the local chapter of the National Industrial Advertising Association.

* * *

**R. M. Beatty**, manager of the Electric Range Department of the Electric Appliance Division of the Westinghouse Electric and Manufacturing Company, has announced the appointment of **Melvin E. Lanning** as merchandise manager of the Range Department.

The new merchandise manager first came with Westinghouse in 1915 in the Denver, Colo., office. He served in World War I from 1917 to 1918. At the end of the war, he returned to Westinghouse in the electric appliance sales in the Colorado area, principally promoting electrical ranges through the public utility companies and also selling small appliances and fans.

Mr. Lanning, who has been with Westinghouse for 24 years, has been stationed in the Westinghouse St. Louis office since 1937, serving successively as southwestern ditrict range supervisor, southwestern district sales development manager and merchandise supervisor.

* * *

Effective July 1, **John W. Horne** became manager of Graybar Electric Company's Savannah, Ga., branch. He succeeds **Harry B. Stanton,** who is retiring from the company after 43 years of service.

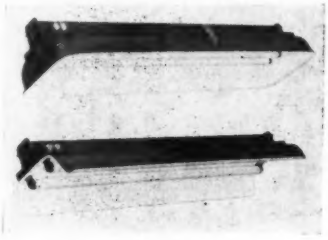
Mr. Horne joined Graybar in 1933, serving first at Miami, later at Savannah and Tampa, and then returned to Savannah in 1942 as combination supply and appliance salesman.

Mr. Stanton, throughout his long career with Graybar, has also been active in community and electrical organizational work. He served as president of the Electric Association of Savannah; member of the Board of Directors of the Rotary club; vice president of the Chamber of Commerce; Scout Commander of Savannah area (Boy Scouts of America); president of the Anglers and Hunters club.

## New Electrical Products

### Mitchell All-Steel Units

A new line of "Mitchelite" all-steel industrial fluorescent fixtures is announced by the Mitchell Manufacturing Company, Chicago, Ill. The new units include two 40-watt, three 40-watt and two 100-watt models, with choice of open-end or closed-end reflectors, in baked enamel or porcelain enamel finish. New, perfected "instant-start" feature is available on the two 40-watt models. Wireway channels and reflectors are constructed of heavy gauge steel. Units finished in battleship gray outside.



Accessories provide for every method of mounting or hanging—individually or in continuous rows. Entirely new type Aircraft "Instant-Latch" is provided on all units for quick, easy release of reflectors without use of tools.

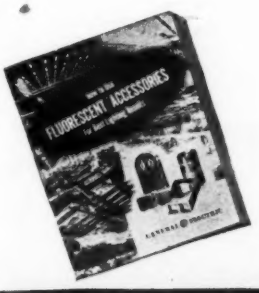
All units are Underwriters' Laboratories and E.T.L. approved. Power factor over 90%. Stroboscopic corrected. 110-125 volt, 60 cycle A.C. (also available in higher voltages). Priority: AA-5 for new lighting projects; AA-2 under MRO. These units are distributed through leading electrical wholesalers. For full details, write for new "Mitchelite" catalog No. 281, to the Mitchell Manufacturing Co., 2525 Clybourn Ave., Chicago 14, Illinois.

### Controlled Light Reflector

A noteworthy development in the field of industrial fluorescent lighting has been achieved by Smithcraft through the use of the V Controlled Light Reflector. It is said that this entirely new scientifically engineered V reflector provides the utmost in lighting efficiency and output. Other features claimed are that light loss is reduced to a mini-

**Reset It.. Forget It**

HERE'S how the Watch Dog Fluorescent Starter simplifies lighting maintenance. When a lamp dies the Watch Dog automatically cuts itself out of the circuit stopping annoying blink and flicker. The manual reset button pops up preventing futile and needless starting attempts. Then the maintenance man can replace the burned-out lamp at his convenience. He merely presses in the red button, inserts a new lamp and the lamp immediately begins to operate normally. It's as simple as that. Just reset it and then forget it.




**This new catalog** tells how to use G-E Fluorescent Accessories for best lighting results. You can obtain your free copy by writing to Section G942-16, Appliance and Merchandise Dept., General Electric Company, Bridgeport, Conn.

★ BUY WAR BONDS AND KEEP THEM ★

*Hear the General Electric radio programs: "The G-E All Girl Orchestra" Sunday 10 P.M. EWT, NBC. "The World Today" news every weekday 6:45 P.M. EWT, CBS.*

GENERAL ELECTRIC

mum, that the controlled light reflector directs maximum light to the working plane and actual footcandle tests prove its greater effectiveness.

It is announced that this new series incorporates all basic tested Smithcraft features, such as mechanical excellence, all-steel for strength, wide variety of mounting methods, new captive-turn positive reflector fastener or release, Supercoat finish, baked or porcelain enamel, simple installation and easy maintenance. For further information, write A. L. Smith Iron Co., Chelsea 50, Mass.

### New Sylvania Starter

Sylvania Electric Products, Inc., has launched production of a new push-button type starter that automatically safeguards fluorescent lamps and ballasts against harm while simultaneously guarding against waste of electric current, it was announced recently.

Officially labeled the COP (Cut-Out Premium), the starter not only serves its major function of putting a fluorescent lamp into operation, but will automatically cut the circuit in case of lamp failure. It "patrols" a fluorescent lighting installation, protecting lighting investments.

In exhaustive tests, the COP has shown a life expectancy five times as long as the average starter. It halts annoying flicker or blinking by cutting a deactivated lamp out of the circuit almost immediately. It prevents waste of current and protects ballasts from overheating.

Equipped with a handy push-button, the COP is ready to give continued service when the fixture is fitted with a replacement lamp. Push the button and the COP swings into action again. The COP starter is made in one size, the COP-4 for 40-watt fluorescent lamps.

### Guth All-Steel Fixtures

Relaxation of weight-limitations by WPB, has made possible the return of Futurliter, the fluorescent luminaire for continuous-flow illumination. The Futurliter is made for two and three rows

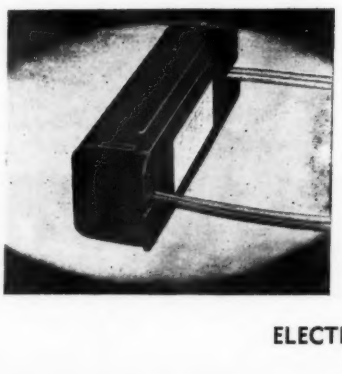
of 40-watt lamps and can be mounted directly to the ceiling or suspended. It provides high-intensity shielded illumination and its unique construction makes for a minimum of maintenance expense.

For built-in sections for continuous-flow lighting, the Futurliter is available with cooling sections (see photo above), with air-disinfection sections (for germicidal lamps), and with color improving sections (with filament lamps). They are available for immediate delivery. For further information, write direct to The Edwin F. Guth Company, 2615 Washington Ave., St. Louis 3, Mo.

### Two-way-lead Ballasts

New two-way-lead ballasts for the operation of Mazda F lamps have recently been announced by the General Electric Company, and are currently available in the following ratings: Tulamp 30 and 40-watt, standard cross section; Tulamp 40-watt, high voltage; Tulamp 100-watt; Three-lamp 40-watt; and Forlamp 100-watt.

With leads that can be brought out at either the ends or the bottom of the ballast cases, the new ballasts are interchangeable



with—and serve the same applications as—both the superseded leads-out-the-end and leads-out-the-bottom ballasts of the same ratings. They are equally applicable to exposed or enclosed mounting on both commercial and industrial fixtures.

Provision for center-hole or corner mounting has been retained and fixture design changes are not required for application of the new ballasts. Electrically they are identical to the ratings which they replace and prices and dimensions are also unchanged.

### Infra-Red Heat Units

A survey conducted recently by The Fostoria Pressed Steel Corp. revealed that industrial plants have a great need for portable radiant energy equipment to facilitate baking, drying, dehydrating and preheating operations. The extreme flexibility of model P-7-IR, designed for such service, permits it to be used in singular or multiple assemblies. Adjustable features of the cross arm on the upright and the reflector yoke allows the radiant energy to be directed at various angles from a height of 18 inches to 6 feet.

Research disclosed that this model is advantageous for drying out electrical equipment, drying off material after degreasing, baking insulation on electric motor parts, baking finish on a variety of products, preheating material to facilitate assembly, preheating thermoplastics to facilitate shearing, punching, molding, experimental purposes in laboratories, dehydration operations, etc.

Descriptive material is available from The Fostoria Pressed Steel Corporation, Fostoria, Ohio.

### Graybar Offers New Catalog

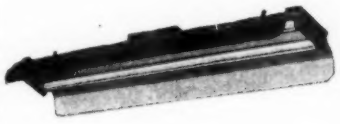
Designed to cover materials and equipment used in all phases of rural line construction and maintenance, Graybar's new catalog contains eighty-eight pages on which over four hundred electrical items are listed and illustrated.

Included are thirty-four drawings of typical rural line structures, materials schedule charts and list of materials to facilitate selection and ordering. There are also seven pages devoted to inside wiring, emphasizing those items most commonly used in all types of rural wiring. Copies of the cat-

alog are available upon request at the nearest Graybar office, or write Graybar Electric Co., Inc., 420 Lexington Ave., New York 17, New York.

### New Silv-A-King Unit

To meet the demand for a low-priced fluorescent industrial unit, the Bright Light Reflector Company has developed the new Silv-A-King "Economical" unit. This new line combines many distinctive features usually found only



in more expensive equipment.

Bright Light is again able to put an all-steel unit on the market. The steel reflector meets all RLM requirements for reflectivity, shielding angle, contour, and overall efficiency. The hood, finished to match the outside surface of the reflector, is fitted with rigid end-plates that act as "bumpers" to prevent sockets from breaking or being forced out of position. Knockouts are provided in the end-plates for bushings and locknuts when the units are joined together. These knockouts can also be used for a pull switch.

Provision is made in the "Economical" 40 line for the insertion of sockets and starters, permitting the addition of a third lamp for increased lighting requirements. In order to provide natural air circulation and to dissipate the heat, the ballasts has been left exposed. For full details write to Bright Light Reflector Company, Metropolitan and Morgan Avenues, Brooklyn 6, N. Y.

### Service Entrance Items

Bulletin No. 14 of The M. & W. Electric Manufacturing Company, Inc., of East Palestine, Ohio, manufacturers of Easy-Way wiring devices and watt-hour meter protectors, was issued recently and contains descriptive information on a wide range of products available from this company. Among the items described are M & W watt-hour meter protectors, watertight and current diversion proof entrance cable connectors, ground clamps, and a variety of service entrance cable fittings.

SLATER STREET LIGHTING LAMPS
Minimize Troubleshooting
Replacement of inferior lamps represents a substantial part of street lighting maintenance costs. For when lamps do not provide their full rated lamp life, troubleshooting takes its toll in wasted manhours, tire and truck depreciation, waste of gasoline, and extra trips. SLATER Lamps minimize troubleshooting because they are free from defects, and are built to give high efficiency during their rated lamp life. Other reasons why SLATER Lamps keep down maintenance costs are explained in our catalog . . . yours for the asking.
SLATER ELECTRIC & MFG. CO.
MANUFACTURERS OF STREET LIGHTING LAMPS AND ELECTRONIC TUBES
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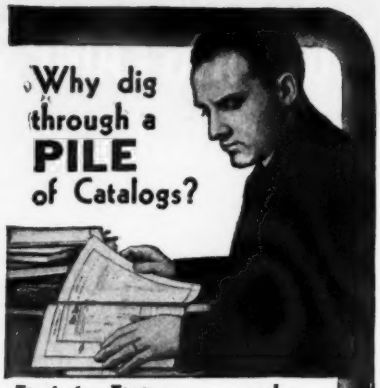


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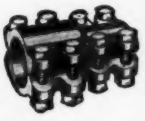
If you have a Penn-Union Catalog, you can instantly find practically every good type of conductor fitting. These few can only suggest the variety:

**Universal** Clamps to take a large range of conductor sizes; with 1, 2, 3, 4 or more bolts.

**L-M Elbows**, with compression units giving a dependable grip on both conductors. Also Straight Connectors and Tees with same contact units.

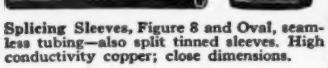
**Bus Bar Clamps** for installation without drilling bus. Single and multiple. Also bus supports — various types.



**Clamp Type Straight Connectors and Reducers, Elbows, Tees, Terminals, Stud Connectors, etc.**

**Jack-Knife connectors** for simple and easy disconnection of motor leads, etc. Spring action — self locking.

**Vi-Tite Terminals** for quick installation and easy taping. Also sleeve type terminals, screw type, shrink fit, etc. etc.



**Splicing Sleeves, Figure 8 and Oval**, seamless tubing—also split tinned sleeves. High conductivity copper; close dimensions.

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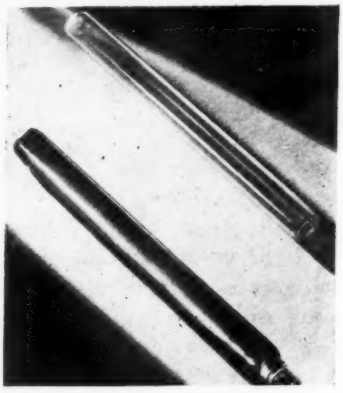
Dallas Transfer & Terminal Warehouse Bldg.
DALLAS, TEXAS

**PENN-UNION ELECTRIC CORPORATION**
ERIE, PA.

**PENN-UNION**
Conductor Fittings


## New "Black Light" Source

Extruded Tenite tubes form sleeves over fluorescent lamps. Dyed by a special process, the tubes filter black light which activates fluorescent-treated dials and knobs on airplane instrument boards. The plastic filter and lamp combination costs a fraction of present sources of black light as produced with mercury vapor or carbon arc lamps. Furthermore, the Tenite filter requires no transformer or similar accessories and does not generate intense heat. Tenite has good dimensional stability and is extruded to very close tolerances to assure a perfect fit between lamp and sleeve.



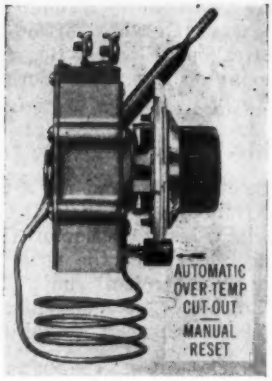
For postwar use, the manufacturers expect this lamp unit to find extensive use for automobile dashboards, radio and television dials, control knobs, switches, and door handles. With respect to fluorescent-treated radio dials in particular, a variety of color combinations and effects can be produced.

Tenite sleeves are extruded by Extruded Plastics, Inc., Norwalk, Conn., for Lion Mfg. Corp., Chicago, Ill. The Tenite used is a cellulose acetate butyrate product of Tennessee Eastman Corp., Kingsport, Tenn.

## Electric Temperature Control

The H 1 Electric Temperature Control with manual reset over-heating cut-off feature is now offered by the Commercial and Industrial Division, Robertshaw Thermostat Co., 30 Church St., New York 7, N. Y.

This device consists of a standard Model D 1 double pole, single throw electric temperature control, equipped with an auxiliary single pole, single throw switch which will automatically cut off all current as soon as operating temperature is exceeded by 30°F in liquid or 50°F in air due to negligence, or fusing of thermostatically operated contacts, etc.




During normal operation this control will break both sides of the line. In case of excessive temperatures, the safety contact (auxiliary switch) is broken on one line only and this is sufficient to break the circuit to the heating element.

The circuit is made through the contacts of the limiting device by pushing in on the re-set manually operated button. The contact is then made and held in place by a locking device, or safety catch, which is not disturbed by normal operation and does not act, or operate, until excess temperatures create an additional movement (expansion) of the diaphragm and that movement raises the safety catch and causes contacts to separate. This break of contacts will occur even if the main contacts have become fused.

A limit control without the temperature controlling mechanism is also available. Both devices are fully described in a bulletin now ready for mailing.

## Fire Alarms and Signals

The Faraday Electric Corporation, a consolidation of Stanley & Patterson and Schwarze Electric Company, which maintains headquarters at Adrian, Michigan, has issued two new buletins designated as No. 1044 and No. 1045.

Bulletin No. 1044 describes the Faraday line of fire alarm signaling systems and apparatus. In addition to complete specifications, the bulletin includes a helpful section on suggested fire alarm symbols and definitions of fire alarm terms.

Bulletin No. 1045 describes the company's complete line of signal and communication systems for hospitals and nurses' homes. In addition to complete descriptive material on the products, the bulletin includes helpful material on

wiring diagrams, suggested symbols for communication systems, and other information that will be helpful to designers of such systems.

### "Tool Room" Metal Etcher

Anything made of iron, steel or its alloys can be easily and quickly etched with the new "Tool Room" Metal Etcher announced by the Ideal Commutator Dresser Company, 1017 Park Avenue, Sycamore, Illinois.

It is especially suitable for marking tools, gauges, reamers, dies, punches, jigs, fixtures, etc. Marks numbers, sizes and other important information. The mark is burned right into the surface so that it cannot be worn off through ordinary usage.

Depth of mark is controlled by etching heat and speed of writing. Four etching heats are 120, 240, 420 and 700 watts. Outstanding features include red indicating lamp, protected four heat switch, removable hinged cover, terminal tap for "small" two ounce etching tool and renewable work plate. All parts are enclosed in a compact, attractive case.

In addition to the standard four ounce etching tool, a small two ounce tool is also available for marking thin delicate parts. Overall size, 7¼" x 5⅛" x 8½"; weight 16 lbs.

### V-Belt Drive Data

A new 44-page handbook on industrial fractional horsepower V-belt drives has just been published by The B. F. Goodrich Company, Akron, Ohio, and is now available upon request.

The booklet notes the trend toward larger sheaves in both fractional horsepower and multiple V-belt drives, describes the construction of B. F. Goodrich fractional horsepower V-belts and gives prices and data on both sheaves and belts.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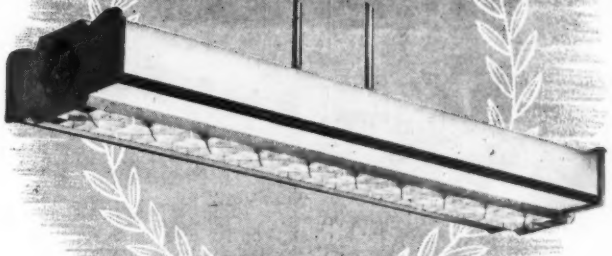

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Where customers demand quality in a four-lamp pendant fluorescent luminaire, Curtis StarLux is a natural choice.

Substantially constructed of durable materials, this beautiful luminaire is characterized by the careful design and workmanship which has made Curtis equipment a leader in the quality lighting field for over half a century.

On the next job that requires beauty, efficiency and lasting quality, specify Curtis StarLux.

Write for our illustrated folder, Serial 2039, giving full information.

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DURING these critical times we found that our best service to our country consisted in doing well the job for which we were best qualified. That meant turning out, in great quantity, wires, cables, conduits, connectors and other items of the highest quality, to serve directly and indirectly, every branch of the armed forces. With victory and peace, we can again render old and new customers the service for which National Electric has always been noted.

★ ★ ★ NE ★ ★ ★

**National Electric Products Corporation**

**Pittsburgh, Pa.**

*Quality Electrical Products Since 1905*

### Panelboard Conversion Plan

A 16-page pamphlet describing a unique method of converting obsolete and inadequate electric light and power panelboards to full efficiency and modernness without disturbing the box or conduit. Booklet is illustrated with "before" and "after" illustrations accompanied by brief history of each case. Write for publication CA-575, Square D Company, 6060 Rivard St., Detroit 11, Michigan.

### New Current Transformer

The Standard Transformer Company announces the new Type NAS current transformer, designed to meet the needs for a wide range accuracy transformer which enables users to stock only a few sizes to cover the entire field of low voltage measurement.

The NAS is made in three ratios, 200-5, 400-5 and 600-5 amperes, insulated for circuits not to exceed 1,000 volts and capable of high accuracies on burdens up to 25 volt amperes. Type NAS is built to AIEE, EEI and NEMA specifications.

Features of this new type of transformer include permanent, easily discernible polarity markings; similar primary mounting dimensions on all three ratios — facilitating interchangeability; simple, practical clamping structure; mechanical connector type primary potential terminal; secondary short circuiting device; tamper-proof sealing facilities; and extreme accuracy.

Details on this type NAS current transformer are contained in Bulletin S-502, copies of which may be obtained through this publication, or direct from the manufacturer, The Standard Transformer Co., Warren, Ohio.

### Identifying Wire Markers

The Western Lithograph Company, 600 East Second Street, Los Angeles 54, Calif., has issued an interesting bulletin describing their new E-Z-Code wire markers. The E-Z-Code markers are made of flexible, durable, waterproof material ready to apply without moistening. They consist of a wide range of numbers and code designations printed on adhesive strips. These strips can be applied to wires by wrapping around them. They are useful for electrical and electronic assemblies as well as for maintenance and repairs, and even inexperienced workers can code an intricate assembly speedily and accurately with this new material. Further information can be obtained by writing the manufacturer.

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### Simplifying Power System Layouts

*(Continued from page 50)*

nates one voltage transformation and thus frees distribution substation capacity for residential and small commercial loads. A network protector on each transformer bank results in higher cost than a transformer in the straight radial system as illustrated in Fig. 12. The total equipment cost in the network system will be less than in the radial system, however, because there is no distribution substation cost to be included for this scheme. For example, based on the cost of equipment shown in this figure and the costs for substation "C", the equipment cost per kva of demand at a customer service will be about $8 for the network system and about $11 for the radial system. This shows a saving in equipment cost of about 20 per cent in favor of the secondary network. The total saving will often be greater

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That Extra Demand Required
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than this when the substation land and building costs and the circuit costs are included.

**Summary**

If as careful engineering is done in connection with distribution as has been done with generation and transmission schemes, the system arrangement can be simplified and still render the service demanded by the customers. Equipment and lines have increased in reliability over the last 20 years to the point where simplified substations and systems can be considered that would have been entirely impractical from a service point of view two decades ago. This will mean less equipment accompanied by a degree in maintenance and other costs.

This is just one chapter of the book on power system economics that the industry will have to write for itself if it hopes to maintain its illustrious record of high quality service and low prices for its goods. These ideas are presented in the hope that they will promote increased study not only in the distribution component of power systems—where the most promising money saving prospects lie — but also in other parts of the power system as well.

## Regulations Affecting Radio Servicemen

*(Continued from page 40)*

Supplier's Certificate shown in Order L-265 and purchase a new replacement part to place in his inventory. This will allow the serviceman starting out with no inventory to gradually accumulate an inventory as he actually uses the parts.

Under the terms of CMP Regulation 9A the repairman may purchase a 60 day supply of such material as miscellaneous hardware, dial boards, sockets, adaptors, etc., with the use of a AA-3 rating. Under no conditions, however, may the repairman use this rating to obtain capacitors, microphones and loudspeakers, resistors (fixed and variable), transformers and chokes, and tubes. Under the terms of a recent amendment to CMP Regulation 9A, the purchase of these parts is specifically prohibited. In addition to the above rating, a repairman doing repair work for a person who has the right to use a preference rating higher than AA-3 to buy replacement parts may extend

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8 CUP . . $2.95
4 cup (with cover) $2.95

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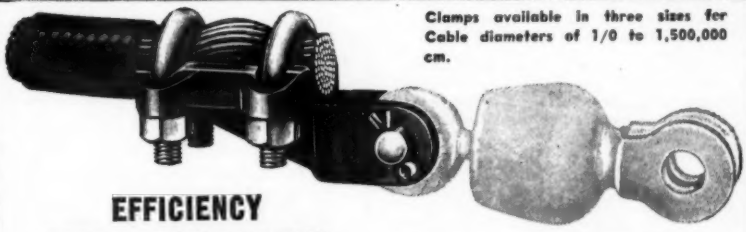
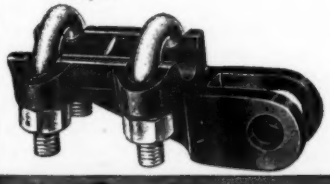
"EFFICIENCY" DEVICES FOR CONDUIT AND CABLE SUSPENSION



Clamps available in three sizes for Cable diameters of 1/0 to 1,500,000 cm.

EFFICIENCY CABLE STRAIN-CLAMP

. . . Stands *Direct Pull* of over 17,000 lbs. before cable slips!



By actual test, the EFFICIENCY Cable Strain Clamp will withstand a direct pull of over 17,000 pounds without permitting the cable to slip. This powerful grip results from the EFFICIENCY Clamp's "H" design, incorporating a high ridge across the center of the cable channel and a U-bolt at each end.

Adaptability to all requirements is provided in the EFFICIENCY Clamp's alternate construction . . . which may be clevis or eye, according to your requirements. Both styles are furnished for A.C. or D.C. service.

Write today for your copy of EFFICIENCY Catalog No. 38B . . . contains complete construction and application data on all EFFICIENCY Devices.

Efficiency ELECTRIC AND MANUFACTURING

# T&B STA-KON* PRESSURE TERMINALS

## YOUR T&B DISTRIBUTOR HAS THEM IN STOCK

Convenient packages

**Sta-Kon Terminals are stocked by your local T&B Distributor. Contact him for prompt delivery.**

**Sta-Kons are the small wire terminals that eliminate the fuss and hazards of soldering. Quick and easy to install with T&B Pressure Tools—manual or power. Insure a positive electrical and mechanical connection. Resistant to corrosion and vibration. Approved.**

**Sta-Kon Terminals made in hundreds of shapes and sizes for wires No. 22 through 250 mcm, are sold, like all T&B products, exclusively through the service organizations of T&B Electrical Wholesalers.**

*For full engineering data on Sta-Kon Pressure Terminals write for illustrated Bulletin 500.*

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this rating to replace his inventory.

Tubes for civilian replacement purposes are purchased under Order L-265 and no preference rating is necessary. These tubes are set aside by the manufacturer for this purpose and are marked "MR". War Production Board rules and regulations prohibit the use of these tubes for any purpose except for civilian radio maintenance and repair.

CMP Regulation 5 allows repairmen a AA-5 preference rating to extend to suppliers or manufacturers for the purpose of purchasing tools and certain test equipment. However, test equipment is one of the most critical of all items needed for the military services. Therefore, a close study of all items using X or XY procedure as shown on Table 9 under General Scheduling Order M-293 should be made.

The repairman should refrain, if possible, from requesting such items as listed on Table 9, when they require a special authorization. He should look for substitutes and ask suppliers for lists of equipment readily available before requesting these items. If it is necessary for the repairman to request any of the items listed, he must submit a WPB-3243 form, which is a request for authorization to purchase equipment, to the Radio and Radar Division, WPB, Washington, D. C. A repairman servicing civilian radios may extend a priority rating of AA-5, as provided under CMP Regulation 5, for purchase of minor items of capital equipment.

A directive or an AA-1, AA-2 and AA-2C preference rating *cannot* be obtained to assure delivery of material for civilian use. The electronic industry is being taxed to the utmost in furnishing the military services with the necessary equipment. Directive and AA-1 ratings are used exclusively for the military services or by the industry manufacturing equipment for military use. The Radio and Radar Division is scheduling production of repair parts to the limit of the manufacturers' capacity. Such quantities of parts as are available for repair of civilian radio sets are available without preference rating. In general, the assignment of a preference rating would be ineffective unless it were a high rating and such a rating would only be effective by diverting from military channels material which the WPB has already allocated for military use.

## Tune Up Lighting for All-Out Production

*(Continued from page 16)*

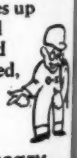
tion that would be satisfactory for this type of work may not be deemed justified. Semi-general supplementary lighting should be used. A boring mill, as an example, can be lighted adequately with two 2-lamp fluorescent units mounted parallel to each other, one on either side of the machine. If the machine is large, a third fixture should be mounted to create a "U" shaped fixture pattern (Figure 11). The necessary intensity and distribution of light then would be maintained on the work area. Considerable light strikes important vertical surfaces and the cross lighting from the fixtures will eliminate objectionable shadows.

With care in checking the possibility of improving the visibility of the operator's work, whether it be a grid system layout, "U," "L" or "T" shaped patterns; or a conventional layout; there is a form of lighting application that will do the job.


# O.Z. EXPANSION FITTINGS

## . . . FEWER PARTS— QUICKER INSTALLATION!

**This unit was designed to compensate for expansion or contraction in a line of conduit. The expansion head is sealed by a high-grade packing, making it moisture proof. Bakelite bushings prevent abrasion of the cables inside the casing. This type, designated as "AX", is shorter and more compact than regular units, is made up of fewer parts, takes up less room and can be installed quickly. Furnished in standard malleable iron, cadmium plated, or in bronze. Also supplied for thin wall (EMT). Ask for type TX.**



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**Send for the new O. Z. Catalog No. 125. Here you will find, illustrated and described with detailed specifications and price lists, the most than 160 O. Z. electrical fittings including Conduit Fittings . . . Cable Terminators . . . Junction Boxes . . . Solderless Connectors . . . Power Connectors . . . Grounding Devices.**

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## Spotlighting the Commercial Market

*(Continued from page 23)*

demonstrate, the relighting market can offer a great opportunity. And if relighting pays new prospects in the same ratio that other merchants who have relighted have profited, the salesman need have no fear of overselling his prospects.

Fortunately for the rest of us, there are figure-minded men in every line of business, careful buyers who measure what they buy. So, there's a lot of proof that pre-war relighting paid. In the tabulation which follows is enough proof data to give any lighting salesman an idea of what he can say to his commercial customers—indicate the sales gains that can be attained when better selling-light has been installed in the stores in his territory.

Here is a group of stores characteristic of almost any town in America, stores in which re-lighting has helped to attain measurable increases in traffic and profit. The detailed study from which almost-incredible average sales gains were taken was made by utility and contractor men and checked by personal calls by members of an organization closely related to the General Electric Company. Individual reports, certified by store owners, document the increases in sales traceable to relighting.

| Kind of Store | Average Sales Gains After Re-Lighting |
|---|---|
| Apparel Shops | 21% |
| Automotive Stores | 19% |
| Drug Stores | 24% |
| Food Stores | 20% |
| Filling Stations | 24% |
| Furniture-Household-Radio Stores | 27% |
| General Mdse. (Department Stores) | 22% |
| Hardware Stores | 40% |
| Jewelry Stores | 37% |

In all the principal classifications, in store after store, wartime studies of pre-war installations indicate that higher lighting intensities help to attain higher sales and profit totals The case histories recorded here, gains that average 26%, are fairly typical. Cut them in half and the lighting salesman can still show his commercial customers that planned store lighting pays. When similar data becomes available for jewelers, restaurants, cigar stores, bars and liquor stores, such classifications as lumber and building material retailers, gains probably


*It fits everywhere!*

CHROMALOX HEATFLO

The replacement range unit. A small stock, with clip-on adaptor rings—

- Fits all ranges
- Fits the needs of easy servicing
- Fits every condition of fine cooking

*Chromalox Super-Speed range units and parts available without priority—under WPB Order L-65.*

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M. & W. WATER-TIGHT RUBBER BUSHING TYPE CONNECTORS FOR SERVICE ENTRANCE CABLE

The design of the rubber bushing is such that it has a greater surface contact around the cable than the conventional bushing, assuring a water-tight fit around the cable.

*Send for Copy of Bulletin 14 which illustrates our complete line.*

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EAST PALESTINE • OHIO

DON'T GUESS!—TEST R.P.M.

With a MODEL J
HAND TACHOMETER

Triple Range: 300— 1200 RPM / 1000— 4000 RPM / 3000—12000 RPM

*Rugged • Reliable • Continuously Indicating Type*

WRITE FOR BULLETIN #760

HERMAN H. Sticht COMPANY, INC.
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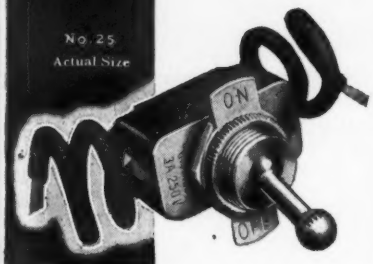
Vibration and Dust PROOF

No. 25
Actual Size




## McGILL Toggle Switches

Here is a new addition to the McGILL line of dependable switches . . . the McGILL Toggle Switch, Nos. 25, 27 and 28 Series. This small, practical, thin, multiple switch is both vibration and dust proof. With a body only 1" long, ½" wide and ½" thick, it fits into the shallowest of places. Approved by the Underwriters' Laboratories, it is ideal for the individual control of small tools, fractional horsepower motors, industrial and office machines, appliances, motion picture projectors, floor and table lamps, airplane and trailer lights, lights in Pullman cars, passenger cars and busses.

They are made in three types. No. 25 single pole rated 6 amp. "T" 125 volts, 3 amp. 250 volts. No. 27, three way, rated 6 amp. 125 volts. No. 28 two-circuit, no off position, rated 6 amp. 125 volts. All types furnished with wire leads or solder lugs.

**McGILL Toggle Switches are easily installed and built for long life. See your dealer, or write for further information.**

McGILL
MANUFACTURING
COMPANY, INC.
*Electrical Division*
VALPARAISO, INDIANA

will compare directly with those shown in the markets already investigated.

The formula is simple, the figures easy to apply. By the use of the factors outlined here, a lighting man can bracket his market, evolve a story to fit each type of prospect in his major market groups. Many new types of fixtures, new combinations of light sources, have been developed for war. Since August 15th, the government has encouraged the evolution of sample lines of current commercial demonstration. The postwar lighting market is very promising and may be nearer than we think!

---

### Light Meter Developments

(*Continued from page 32*)

ange and into a deep red. It is most receptive to a green-yellow light, corresponding to a wave length of 555 millimicrons.

It is obvious, therefore, to make the light meter "practical" that it must "see" light intensity and light color in the same terms that the eye sees them. In other words, the light meter must "see" the various colors in the same proportions as the eye does and it must not respond to radiant energies to which the eye does not respond such as ultra-violet or infra-red.

Referring to the spectral sensitivity chart it will be seen that the Photronic cell is responsive to wave-lengths below 400 and above 700 millimicrons which the eye cannot see and also the photronic cell is more sensitive to the blue, green, orange and red than the eye is. In order for the meter to "see" light exactly as the eye sees it the light meter must have a color response which corresponds to the eye.

A successful solution to this problem was arrived at after much experimentation by research engineers. They produced a filter that blocks or filters out rays the eye cannot see. The Viscor filter, as it is called, is placed over the Photronic cell.

Analysis of the accompanying chart shows that the relative sensitivity of the Photronic cell in combination with the Viscor filter so closely parallels the eye sensitivity curve that to all extent and purpose it provides "absolute" corrections.

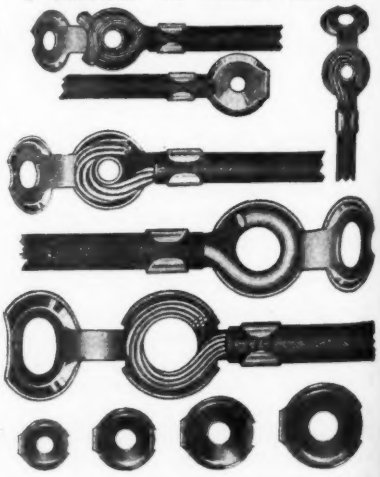
The dramatization angle in the use of light meters to aid sales efforts is beyond the scope of this article. They do exist, and a clever salesman, possessed with the right quality of showmanship, can well afford to capitalize on the sales possibilities of a well-staged demonstration.

Effective usage of a light meter as a guide to light conditions requires, for the most part, just good common sense. Recommended levels of illumination have been established by the Better Light — Better Sight Bureau. All "seeing" activities have been classified into ten grades, depending upon the severity of the visual task.

Correct placing of a light meter requires judgment, so that the reading obtained will be a true indication of the amount of illumination available at a particular location. If a person is working in their own shadow, the reading should be taken in the shadow. The reflection quality of surrounding walls of material should be read. Consideration should be given to the color or darkness of clothing worn, and the material being worked on.

FOLDING DOUBLE CUPPED WASHER LUGS
K&H
OPEN
CLOSED
FOLDS HERE TO CLOSE
NEAT IN APPEARANCE
BRINGS WIRE DIRECTLY UNDER CONTACT SCREW OR NUT

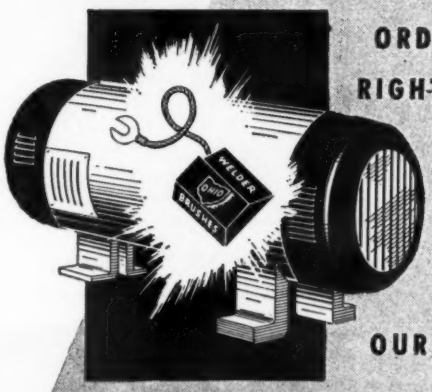
Vibration proof solderless connections are made in panel boxes where space allotment is constricted and neatness essential.



WRITE FOR BULLETIN 8-DF

K&H KRUEGER & HUDEPOHL
Solderless Terminal Lugs and Connectors
VINE AT THIRD-ES . CINCINNATI, OHIO

# Welder Brushes




ORDER THE RIGHT BRUSH FOR YOUR WELDER FROM OUR STOCK

*Keep 'Em Running*
*Specify*

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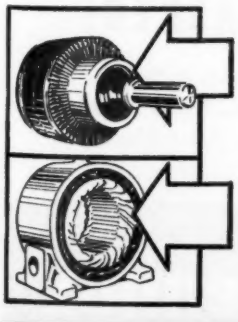
# Synthite

## NO. 10 RED INSULATOR

*For Extra Protection*



Designed primarily for use on stator windings, commutator ends, slip rings, string bands, etc., where it is essential to protect units from oil, water, and corrosive chemical conditions.

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*Insulating Varnish Specialists*
166 Emmet Street, Newark, New Jersey

# ADAPTABLE...
## *FOR MANY PURPOSES*

The Ward Leonard Midget Metal Base Relay has proven so satisfactory and dependable that several adaptations have been made in it to give it even wider application. The relays shown above are the original relay, one with auxiliary contact and one with porcelain insulation. These relays may be furnished with studs in place of metal bases.

Only 1¼ inches in height. For continuous operation on AC and DC voltages up to 110-115. Double pole, double throw. This Relay described in data Bulletin 104. Send for a copy.

ARMY E NAVY

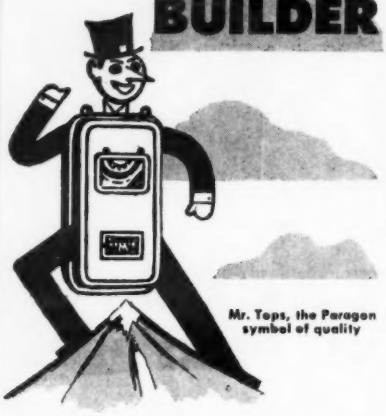
# WARD LEONARD

**RELAYS • RESISTORS • RHEOSTATS**

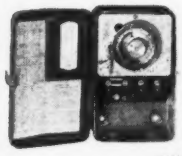
***Electric control*** (WL) ***devices since 1892.***

WARD LEONARD ELECTRIC COMPANY
37 SOUTH STREET, MT. VERNON, NEW YORK

"TOPS" AS A GOOD WILL BUILDER



Mr. Tops, the Paragon symbol of quality



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The time cycle of Paragon synchronous motor operated, instantaneous reset, type relays is unaffected by vibration or changes in ambient temperature. For motor and tube protection.

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***7-Day Time Switches***

. . . are designed for presetting heating or ventilating schedules on a weekly basis with independent daily operations.

***Manually Preset Timers***

The 2500 series is designed to close or open a circuit at the end of a preset interval, such as attic fan control.

Send for complete bulletin. All these units are designed and built by a pioneer in the automatic timing field.

2500 Series

**PARAGON ELECTRIC CO.**
713 OLD COLONY BUILDING
CHICAGO 5, ILLINOIS

Paragon Chicago
BUILDERS OF ELECTRICAL EQUIPMENT SINCE 1903


Periodical measurement of light intensity by maintenance personnel in schools, stores, offices and factories makes the use of a light meter mandatory, and a program of education reaching maintenance personnel will do much to increase lamp renewals.

Periodical checking will indicate the loss of illumination due to dust adhering to reflectors and lamps — to the decreased light intensity due to voltage drop caused by the addition of new electric equipment on the same circuit — to the need for additional illumination when the character of work changes.

## Lighting for Magnification

(*Continued from page 29*)

used around the machines.

The overhead incandescent units, suspended directly over the center of machines are of a deep-bowl type designed for 200-watt incandescent lamps but equipped with 100-watt clear lamps. Twin units are used to give a wider spread of light over the wires and the 100-watt lamps used provide exceptionally good shielding of the light source from the eyes of the operators.

On the machine, three other types of lighting units are employed. The 40-watt incandescent parabular shades are mounted on top of the oven and carefully positioned to provide a glint along the wires as they leave the oven and proceed upward over the sheves. Beneath the oven, wires are again illuminated by glint, using two 40-watt incandescent half-shade units. Under the feeding table, two-lamp 20-watt fluorescent units with one lamp mounted above the other, provide visibility whether the operator is in a standing or squatting position.

In the illustrations which accompany this article is pictured the coordinated lighting of the single machine with the planned localized lighting needed to amplify overhead levels of general illumination. Wherever possible machine parts have been used to provide natural shielding. Twin bowl 200-watt luminaires, housing 100-watt clear lamps, give a wide spread of high glint on the wire, yet completely shield the light source from the operator's normal view.

Wherever similar problems exist in knitting mills, chemical plants, or steel and wire mills, special lighting installations can aid workers. At the Wilbur B. Driver Company, after the operators had worked under the new lighting, they volunteered the fact that illumination which had been virtually unbearable now was completely comfortable.

**BUY WAR BONDS**


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ANTI-CORROSIVE PAINTS
*favored for*
TRANSMISSION
*and*
DISTRIBUTION DEPARTMENTS
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Loose talk costs lives... Keep working ... Keep Mum.

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YOU CAN DEPEND ON

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1915 - 1944

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**AUTOMATIC ELECTRIC HEATER CO.**

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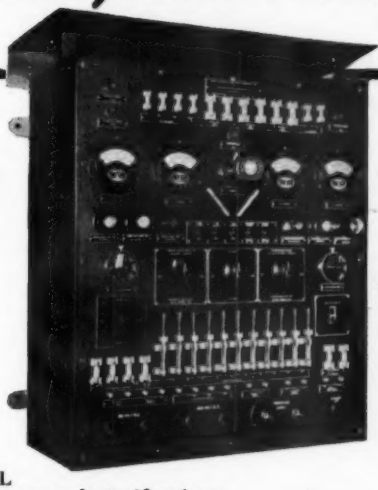
of Every Type

*Including* MARINE WORK



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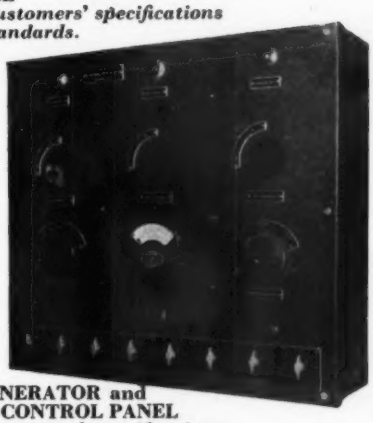
*—built to customers' specifications and Navy standards.*



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*—built to customers' specifications for any number of circuits.*

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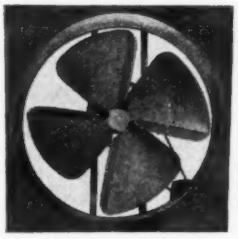

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Single Inlet—Double Inlet. 400 CFM to 12,500 CFM.

Single Inlet Blower illustrated at left is particularly adapted for ventilation of mess halls in military establishments.

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SCHWITZER-CUMMINS COMPANY
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# ADVERTISER'S INDEX

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## A

Adam Electric Co., Frank ..... 12
Aluminum Company of America ..... 5
Americal Blower Corp. ..... 8
American Coolair Corp. ..... 11
American Steel & Wire Co. ..... 43
Anaconda Wire & Cable Co., Inc. ..... 10
Automatic Electric Heater Co., Inc. ..... 95

## B

Briegel Method Tool Co. ..... *
Bright Light Reflector Co., Inc. ..... 80
Bryant Electric Co. ..... 71
Bull Dog Electric Products Co. ..... 47
Burndy Engineering Co., Inc. ..... *

## C

Clark Water Heater Division ..... *
Crescent Insulated Wire & Cable Co. ..... 76
Curtis Lighting, Inc. ..... 87

## D

Dolph Co., Jahn C. ..... 93
Duro-Test Corporation ..... 35

## E

Edison General Electric Appliance Co. ..... *
Efficiency Electric & Mfg. Co. ..... 89
Electric Vacuum Cleaner Co., Inc. ..... 78 and 79

## F

Federal Electric Products Co., Inc. ..... *
Fleur-O-Lier Manufacturers ..... 45
Frigidaire Division ..... *

## G

General Cable Corp. ..... 52 and 53
General Electric Co. (Appliances) ..... 56 and 57
General Electric Co. (Fluorescent Starters) ..... 83
General Electric Co. (Lamps) ..... 6 and 7
General Electric Co. (Wiring Materials) ..... Back Cover
George Co., P. D. ..... 87
Graybar Electric Co. ..... 61
Greenlee Tool Co. ..... *
Guth Co., Edwin F. ..... 65

## H

Hazard Insulated Wire Works ..... 1
Helwig Company ..... 88
Hill-Shaw Company ..... 89
Holdenline Company ..... 51
Hotel Lennox ..... 94
Hotel Mayfair ..... *
Hubbard & Company ..... *
Hunter Fan & Ventilating Co., Inc. ..... Front Cover

## I

Ideal Commutator Dresser Co. ..... *
Insulation & Wires, Inc. ..... 98

## J

Jacksonville Metal Mfg. Co. ..... 95
Johns-Manville ..... 4

## K

Kelvinator Division ..... 68 and 69
Kreuger & Hudepohl ..... [illegible]

## L

Landers, Frary & Clark ..... *
Lloyd Products Co. ..... [illegible]

## M

M. & W. Electric Mfg. Co. ..... [illegible]
McGill Manufacturing Co. ..... [illegible]
McGraw Electric Co. ..... *
Mitchell Mfg. Co. ..... [illegible]

## N

National Electric Products Corp. ..... [illegible]
National Varnished Products Corp. ..... *
Noma Electric Corporation ..... [illegible]
Norge Division ..... *

## O

Okonite Company ..... [illegible]
O. Z. Electrical Mfg. Co. ..... [illegible]

## P

Paragon Electric Co. ..... [illegible]
Penn-Union Electric Corp. ..... [illegible]
Premier Division ..... 78 and [illegible]
Proctor Electric Co. Division ..... *

## R

Robbins & Myers, Inc. ..... *

## S

Sangamo Electric Company ..... [illegible]
Schwitzer-Cummins Co. ..... [illegible]
Slater Electric & Mfg. Co. ..... [illegible]
Spero Electric Corporation ..... [illegible]
Square D. Company ..... Inside Back Cover
Stieht Co., Inc., Herman A. ..... [illegible]
Subox, Inc. ..... [illegible]
Sylvania Electric Products, Inc. ..... [illegible]

## T

Thomas & Betts Co., Inc. ..... [illegible]

## U

United States Rubber Co., Inc. (Tape Division) ..... [illegible]
United States Rubber Co. (Wire Division) ..... [illegible]
United States Steel Corp. ..... [illegible]

## W

Wakefield Brass Co., F. W. ..... [illegible]
Walker Brothers ..... *
Ward Leonard Electric Co. ..... [illegible]
Westinghouse Elec. & Mfg. Co. (Apparatus) ..... Inside Front Cover, 36 and [illegible]
Westinghouse Electric & Mfg. Co. (Appliances) ..... [illegible]
Westinghouse Electric & Mfg. Co. (General) ..... [illegible]
Westinghouse Electric & Mfg. Co. (Lamps) ..... 62 and [illegible]
Weston Electrical Instrument Corp. ..... [illegible]
Wiegand Co., Edwin L. ..... [illegible]
Wiremold Company ..... [illegible]

## Y

Youngstown Sheet & Tube Co. ..... [illegible]

8 and

ack Cover

36 and

62 and

R, 1944



FEB
4
U